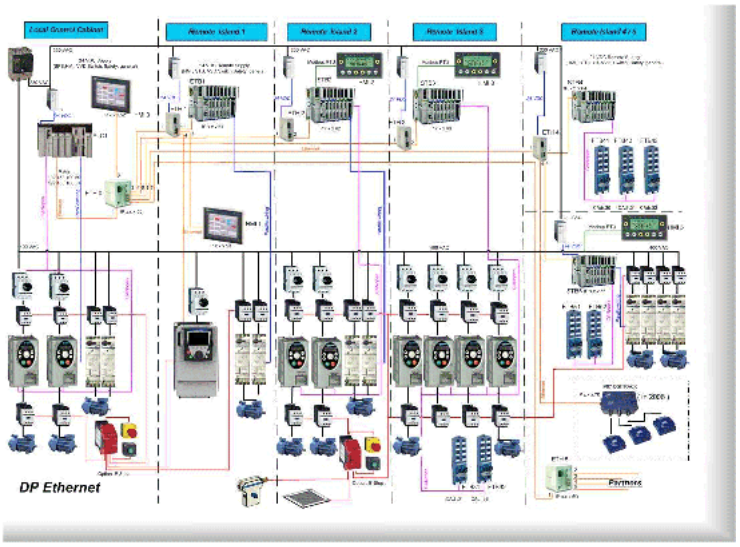
Premium Magelis Altivar Advantys STB on Ethernet

System User Guide

[source code]



Preferred Implementation:
Distributed Ethernet

33003800.01

Merlin Gerin
Square D
Telemecanique

Schneider Electric
Building a New Electric World

Mar 2006

Contents

Application Source Code 3
Typical Applications 3
System 4
Architecture 4
Installation 7
Hardware 8
Software 17
Communication 19
Implementation 29
Communication 32
HMI 35
PLC 45
Devices 67
Appendix 99
Detailed Component List 99
Component Protection Classes 105
Component Features 106
Contact 116

Introduction

This document is intended to provide a quick introduction to the described System.
It is **not** intended to replace any specific product documentation. On the contrary, it offers additional information to the product documentation, for installing, configuring and starting up the system.

A detailed functional description or the specification for a specific user application is **not** part of this document. Nevertheless, the document outlines some typical applications where the system might be implemented.

Abbreviations

Word / Expression	Signification
AC	Alternating Current
Advantys	SE product name for a family of I/O modules
Altivar	SE product name for a family of VSDs
CANopen	Name for a communications machine bus system
CB	Circuit Breaker
ConneXium	SE product name for a Family of Transparent Factory devices
DC	Direct Current
EDS	Electronic Data Sheet
E-OFF	Emergency Off switch
Harmony	SE product name for a family of switches and indicators
HMI	Human Machine Interface
I/O	Input/Output
IclA (ICLA)	SE product name for a compact drive
Lexium/Lexium05	SE product name for a family of servo-drives
Magelis	SE product name for a family of HMI-Devices
MB - SL	SE name for a serial Modbus communications protocol
Micro	SE product name for a middle range family of PLCs
NIM	SE product name for a Network Interface Module
PC	Personal Computer
Phaseo	SE product name for a family of power supplies
PLC	Programmable Logic Computer
Powersuite	An SE software product for configuring ALTIVAR drives
Premium	SE product name for a middle range family of PLCs
Preventa	SE product name for a family of safety devices
PS	Power Supply
SE	Schneider Electric
Sycon	SE product name of a Field bus programming software
Telefast	SE product name for a series of distributed I/O devices
Tesys U	SE product name for a decentralised I/O System (Small Terminal Block)
Twido	SE product name of a middle range family of PLCs
TwidoSoft	SE product name for a PLC programming software
Unity (Pro)	SE product name for a PLC programming software
Vijeo Designer	An SE software product for programming Magelis HMI devices
VSD	Variable Speed Drive
WxHxD	Dimensions : Width, Height and Depth
XBT-L1000	An SE software product for programming Magelis HMI devices

Application Source Code

Introduction

Examples of the source code and wiring diagrams used to attain the system function as described in this document can be downloaded from our "Village" website under **this** link.

Typical Applications

Introduction

Here you will find a list of the typical applications and their market segments where this system or subsystem can be applied:

Industry
- Large packaging machines - Complex machines - Small warehouse sorting systems - Modular machines

Infrastructure
- Airport gateway - Airport energy management - Small airport baggage handling systems - Tunnel control systems

Buildings/Services
- Electrical power distribution - Small sorting systems - Intelligent building automation

Application	Description	Image
Flexible packaging machine	These machines are often connected upstream of a larger packaging or filling plant as feeder system components.	
Inspection and testing machine	Components are inspected and tested with this application. As standalone machines, these testing machines are integrated into complete lines.	
Assembly lines	As part of a complete assembly line, products are assembled and transported in these machines.	
Baggage handling system	Using this application baggage is monitored and transported at airports.	

System

Introduction

The system chapter describes the architecture, the dimensions, the quantities and different types of components used within this system.

Architecture

General

The **D**istributed **P**eripheral architecture of the system comprises of a central station with a PLC and five remote substations with various components.

The **central station** essentially comprises of a PLC (Unity - Premium) with integrated Ethernet and CANopen connection, a graphic HMI (XBTG) display, two motor starters (TeSysU) and two variable speed drives (ATV31). A 7-port switch is used to connect the remote stations to the Ethernet.

As Ethernet nodes, the five remote substations each have a 4-port hub with an interfaced Advantys STB Ethernet coupler.

Remote station 1 comprises of an Advantys STB island (Ethernet) with two directly connected motor starters (TeSysU), a graphic HMI (XBTG) display, and a variable speed drive (ATV71). They are all connected to the Ethernet via an Ethernet switch.

Remote station 2 comprises of an Advantys STB island (Ethernet) with two directly connected motor starters (TeSysU), and two variable speed drives (ATV31), which are connected to the STB-CANopen extender via CANopen. A Magelis (XBTN) display, which communicates with the STB-NIP via Modbus, is used for local visualization.

Remote station 3 comprises of an Advantys STB island (Ethernet) and three Advantys FTB I/O modules which are connected to the STB-CANopen extender via CANopen.

Remote station 4 comprises of an Advantys STB island (Ethernet) and four variable speed drives (ATV31), which are connected to the STB-CANopen extender via CANopen. A Magelis text HMI (XBTN), which communicates with the STB-NIP via Modbus, is used for local visualization.

Remote station 5 comprises an Advantys STB island (Ethernet) with four directly connected motor starters (TeSysU) and two Advantys FTB I/O modules, which are connected to the STB-CANopen extender via CANopen. A Magelis text HMI (XBTN), which communicates with the STB-NIP via Modbus, is used for local visualization.

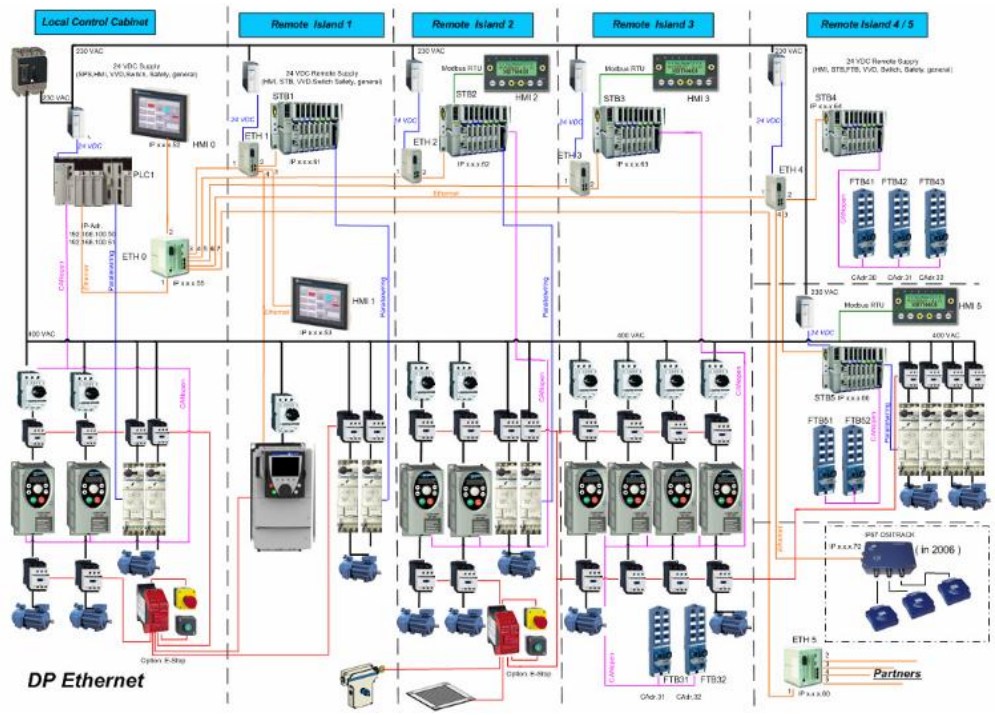
The interface between the PLC, the variable speed drives and the TeSysU motor starters (in future) is:

- In the main control cabinet via CANopen and between the PLC and remote ATV71 via Ethernet-Modbus/TCP (via a switch).
- In the remote STB I/O islands (STB) the ATV31 and FTB IP67 I/O are interfaced via the CANopen extender.

The 20 connected AC motors are operated and controlled from the Magelis XBT-G operator and display terminal.

Protection is provided for with safety modules (Preventa), emergency-off switches and emergency-off master switches.

Layout



Components

Hardware:

- Master switch (NSC100 Compact)
- 24 V power supply (Phaseo)
- ATV31 and ATV71 variable speed drives
- TeSysU direct starter
- Motor circuit breaker (GV2)
- Category 4 safety modules (Preventa)
- Emergency-off switch (XALK)
- Emergency-off master switch (VCF02GE)
- Position switch (XCSA)
- Contactors (LC1D)
- Control system (PLC) incl. I/O cards (TSX Premium)
- Ethernet switch (managed) (ConneXium)
- Ethernet hub (ConneXium)
- Graphic display terminal (Magelis XBT-G)
- Text display terminal (Magelis XBT-N)
- Advantys STB remote I/O island
- Advantys FTB remote I/O island
- Standard AC motor

Software:

- Unity Pro V2.0.2 (PLC)
- Vijeo Designer V4.2.0 (HMI)
- Magelis XBT-L1000 V4.3 (HMI)
- PowerSuite V2.0 (ATV31)
- PowerSuite Launch ATV37
- SyCon system configuration V2.9 (CANopen)
- Advantys configuration tool V2.00 (CANopen)
- ConneXium 10/100 switch configuration tool V1.01 (Ethernet port)

Quantities of Components

For a complete and detailed list of components, the quantities required and the order numbers, please refer to the components list at the rear of this document.

Degree of Protection

Not all the components in this configuration are designed to withstand the same environmental conditions. Some components may need additional protection, in the form of housings, depending on the environment in which you intend to use them. For environmental details of the individual components please refer to the list in the appendix of this document and the appropriate user manual.

Technical Data

Mains voltage	**400V AC**
Power Requirement	~ 11 kW
Drive Power Rating	0.37 kW, 0.55 kW
Motor brake	none
Connection	5x 2.5mm² (L1, L2, L3, N, PE)
Safety Level	Cat. 3 (optional)

Safety Notice

The standard and level of safety you apply to your application is determined by your system design and the overall extent to which your system may be a hazard to people and machinery.

As there are no moving mechanical parts in this application example, category 3 (according to EN954-1) has been selected as an optional safety level.

Whether or not the above safety category should be applied to your system should be ascertained with a proper risk analysis.

This document is not comprehensive for any systems using the given architecture and does not absolve users of their duty to uphold the safety requirements with respect to the equipment used in their systems or of compliance with either national or international safety laws and regulations

Dimensions

The dimensions of the devices used, e.g., the PLC, variable speed drive and power supply, support installation inside a control cabinet measuring 1200x1800x600 mm (WxHxD) for the main cabinet and 600x600x400 mm (WxHxD) for the remote cabinets.

The display terminal, the display elements and the emergency-off switch can be built into the door of the control cabinet.

Installation

Introduction

This chapter describes the steps necessary to set up the hardware and configure the software required to fulfil the described function of the application.

Assembly

Subdivision of main cabinet and remote cabinets

Notes

The programming of this application can be used as a basis for plant and machinery needing a larger number of drives with a whole range of different requirements and acquiring their input and output data centrally via the PLC. Each of the motors is controlled separately by the PLC via Ethernet or the CANopen bus.

The components listed in the next chapter represent just a selection of the components required. In particular, the number of motors used and their allocation to variable speed drives is determined by your actual application (the number of inputs and outputs may also vary).

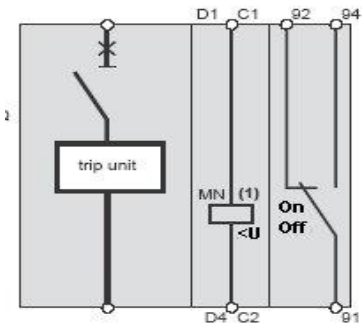
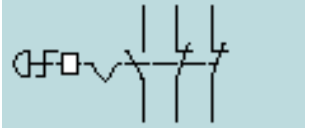
Hardware

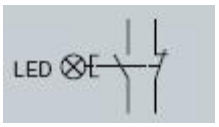
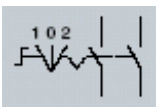
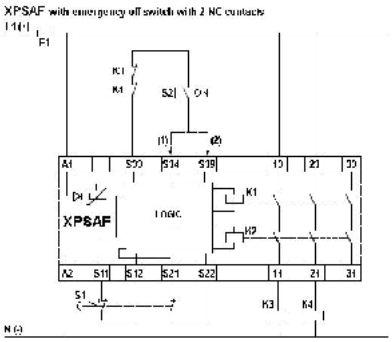
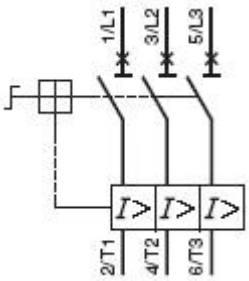
General

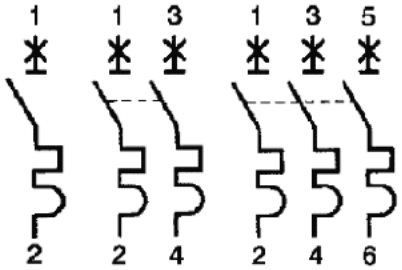
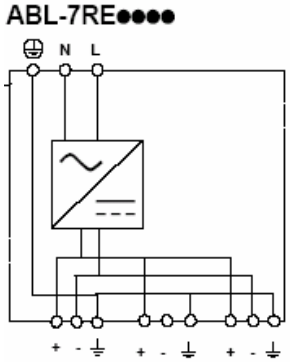
- The components designed for installation in a control cabinet, i.e., safety modules, line circuit breakers, contactors, and motor circuit breakers, can be snapped onto a 35 mm top-hat rail.
- The master switch, Premium PLC, Phaseo power supply unit, and Altivar variable speed drive are screwed directly onto the mounting plate. If you are using the Altivar 31, these components can also be snapped onto a top-hat rail using an adapter.
- The emergency-off and door-safety switches, as well as the housing for display and acknowledge indicators, are designed for backplane assembly in the field; with the exception of the door-safety switch, all switches can also be installed directly in a control cabinet (e.g., in cabinet door) without their enclosing housing.
- There are two options for installing XB5 pushbuttons or indicator lamps: These pushbuttons or switches can be installed either in a 22 mm hole, e.g. drilled into the front door of the control cabinet or in an XALD-type housing suitable for up to 5 pushbuttons or indicator lamps. The XALD switch housing is designed for backplane assembly or direct wall mounting.
- The operator and display terminal requires a cutout to be made in the front of the housing. It is then attached to the housing by means of brackets with screws.
- 400 V / 3-phase AC wiring for the load circuits (ATV, TeSysU).
- 240 V AC wiring for the power supplies.
- 24 V DC wiring for the ATV control circuits and PLC power supply, operator and display terminal, Ethernet switch and hub, HMI.

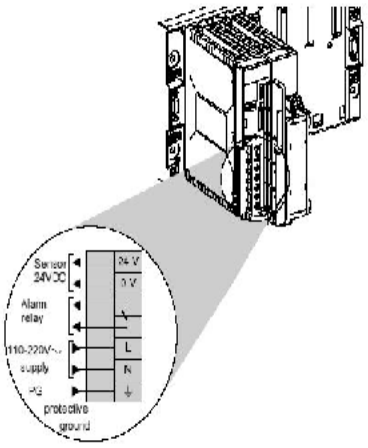
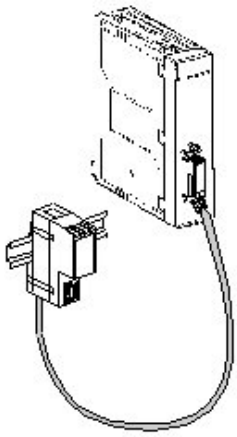
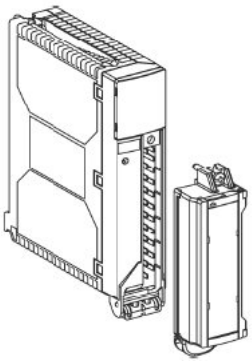
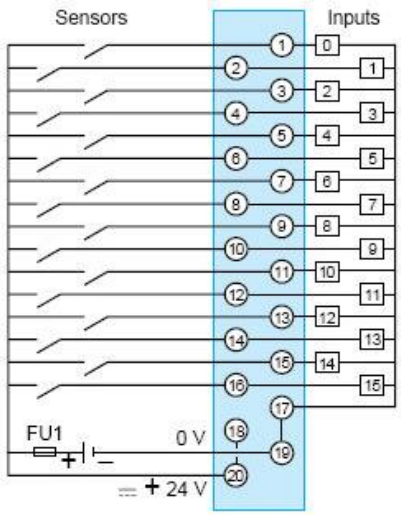
The individual components must be interconnected in accordance with the detailed circuit diagram in order to ensure that they function correctly.

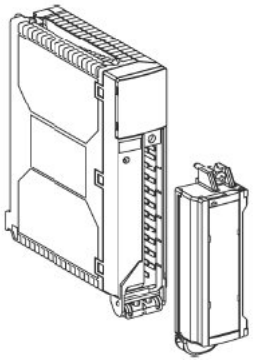
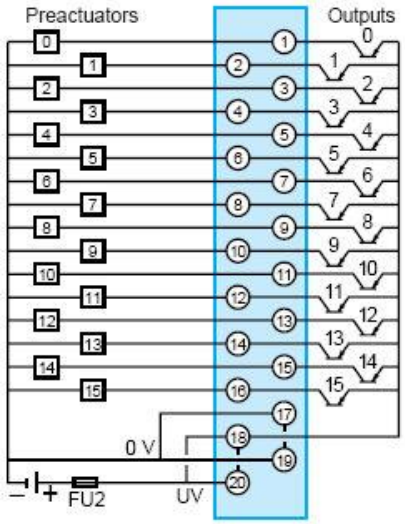
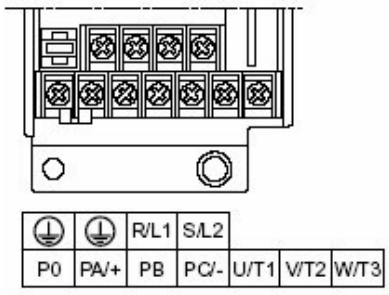
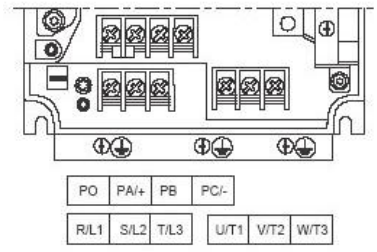
Ethernet lines using pre-assembled cables are laid between the PLC and remote substations for the communications link.
In addition, CANopen bus lines are laid between the PLC and the variable speed drives in the main cabinet and in each of the remote substations, between the STB I/O islands and the variable speed drives or IP67 I/O modules.

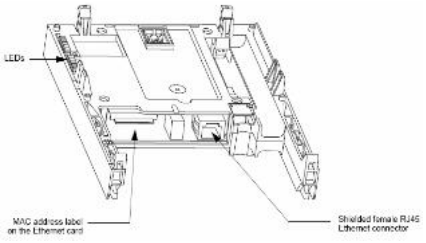
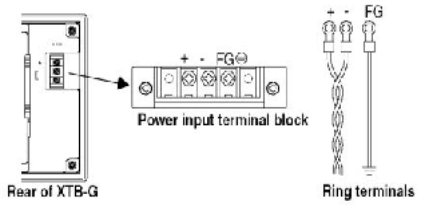
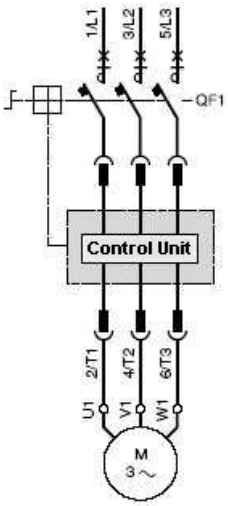
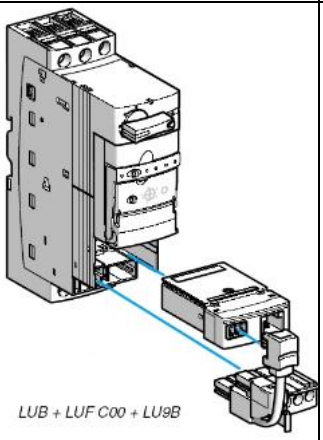
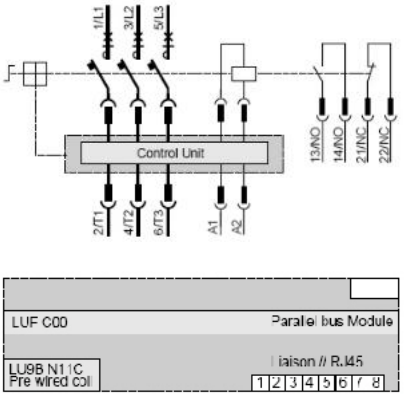
Master switch **NSC 100 compact**		
EMERGENCY-OFF switch (with overload protection) **XALK178G**		

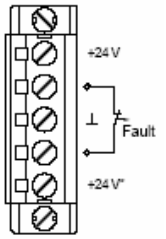
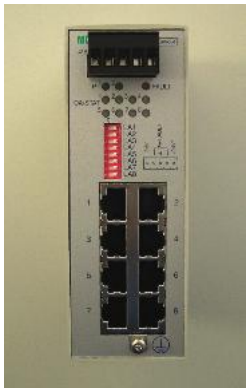
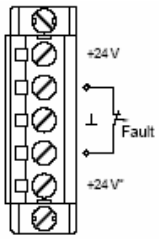
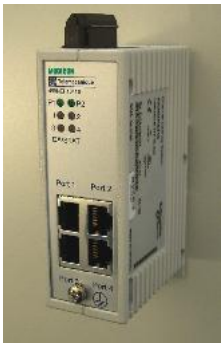
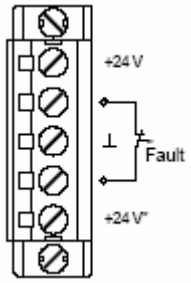
Selector and pushbutton switch **XB5**	 	 
Safety relay **Preventa** **XPS-AF5130**		
Safety relay **Preventa** **XPS-AK311144**		
Motor circuit breaker **Circuit breaker (short-circuit protection)** **GV2-L**		
Motor contactors **LC1D**		

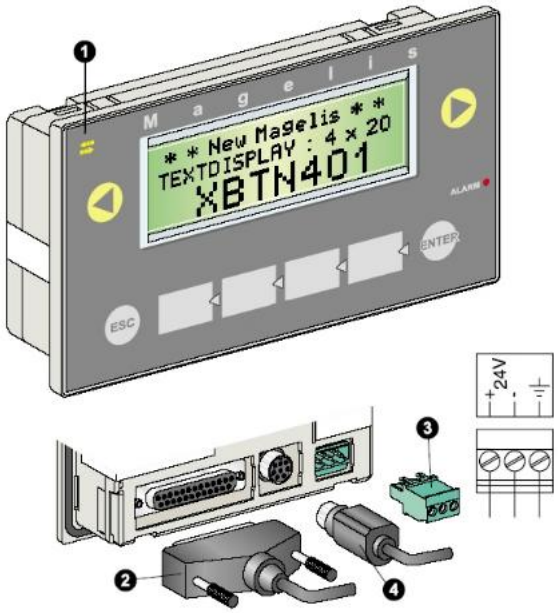
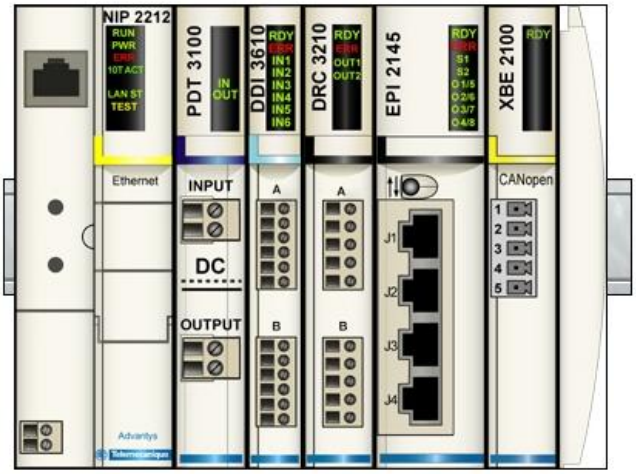
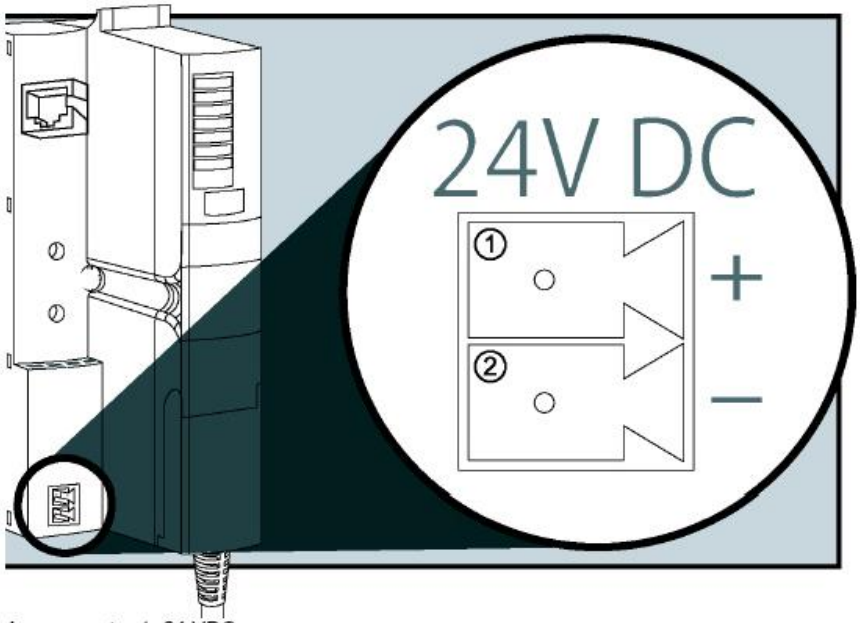
Miniature circuit-breakers **Mutil9 – 1 to 3-pole** **C60H Cx** **C60N Cx**		
Power supply **ABL7RE2405**		
PLC **Premium** **TSX P57 2634**		 **1 - PLC display LEDs** **2 - ETH display LEDs** **3 - RESET button** **4 - PADT connector (TER socket)** **5 - PADT connector (AUX socket)** **6 - RJ45 Ethernet socket** **7 - Slot for memory expansion module in PCMCIA format (type 1)** **8 - Slot for communication card in PCMCIA format (type 3)**

Premium PLC power supply **TSX PSY 2600**		
Premium PLC PCMCIA card **CANopen master** **TSX CPP 110**		
Premium PLC I/O cards **TSX DEY16D2**		 FU1 : 0.5 A fast-blow fuse

Premium PLC I/O cards TSX DSY16T2		 UV : ⎓ 24 V for TSX DSY 16T2 FU2 : fast-blow fuse 6.3 A for TSX DSY 16T2
ATV31 variable speed drive ATV31H037M2 including supply and motor connection		 Description of terminals: Terminal / Function - / Ground terminal RM 1 S/L2 RM 1 S/L2 / Power supply PO / DC bus + polarity PA/+ / Output to braking resistor (+ polarity) PB / Output to braking resistor PC/- / DC bus - polarity U/T1 V/T2 W/T3 / Outputs to the motor
ATV71 variable speed drive ATV71H075N4 including supply and motor connection		 Description of terminals: Terminal / Function - / Ground terminal RM 1 S/L2 RM 1 S/L2 / Power supply PO / DC bus + polarity PA/+ / Output to braking resistor (+ polarity) PB / Output to braking resistor PC/- / DC bus - polarity U/T1 V/T2 W/T3 / Outputs to the motor

ATV71 variable speed drive Ethernet option card VW3A3310		
Magelis operator and display terminal XBT-G2330		
TeSysU motor starter • **Power base (LUB12)** • **Control unit (LUCB05BL)** • **Parallel wiring (LULFC00)**		
TeSysU Motor starter LUB12 LUCB05BL LUFC00 LU9BN11N The power-related components are determined by the motor used.		

Ethernet switch **499 NES 271 00** **manageable** **100/10 MB/s**		 **V24 service interface:** **via cable 490NTRJ11**
Ethernet switch **499 NES 181 00** **100/10 MB/s**		
Ethernet hub **499 NEH 10410** **10 MB/s**		

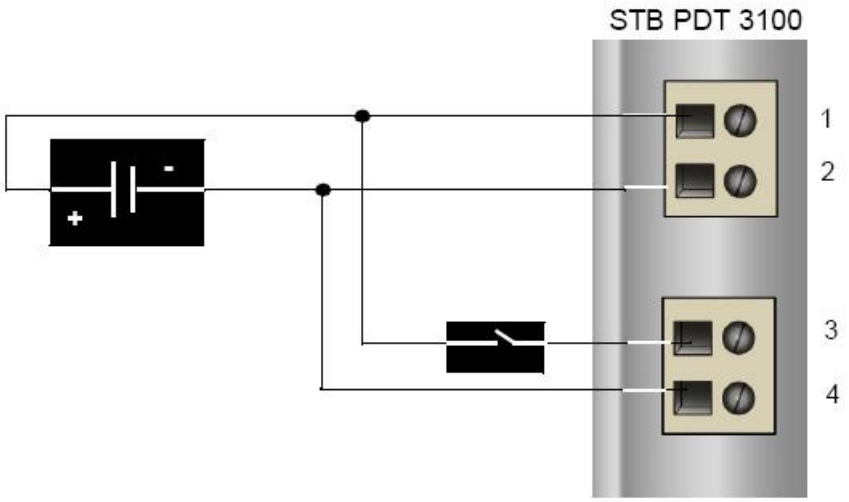
Magelis HMI XBT-N401	
	1 - Front **2 - SubD25 serial interface** **3 - 3-wire terminal for 24 V DC supply** **4 – Mini DIN printer connection (to be used later)**
Advantys STB	
Advantys STB Ethernet bus adapter **STB NIP 2212**	 1 connector 1–24 VDC 2 connector 2–common voltage

Advantys STB

Field power supply

STB PDT 3100

Note:
The output power supply can be deactivated independently of the inputs (e.g., in case of an emergency off).



1 +24 VDC sensor bus power
2 -24 VDC sensor power return
3 +24 VDC actuator bus power
4 -24 VDC actuator power return

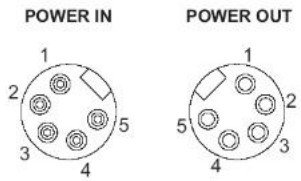
Advantys FTB

FTB 1CN12E04

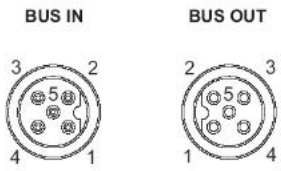
FTB 1CN08E08

Advantys FTB

Power supply and bus connection



Pin 1	0V
Pin 2	0V
Pin 3	PE
Pin 4	+24V DI
Pin 5	+24V DO



Pin 1	Blindage/Screening/Schirmung/ Blindaje/Schermatura/Blindagem
Pin 2	N.C.
Pin 3	0 V
Pin 4	Can H
Pin 5	Can L

For the assignment of the sensor inputs and actuator outputs, please refer to the product description of the modules concerned.

Software

General

You will need to install the **Unity Pro** programming software to program the TSX Premium PLC and the SyCon software to configure the CANopen bus.

You will also need the **Vijeo Designer** and **XBTL1000 software** to configure the HMI displays and to create the necessary user screens.

To maximize user-friendliness in respect of parameterization, archiving and simulation for the variable speed drive (ATV31/71), install the **PowerSuite** software (PowerSuite Launch ATV71).

You will need the **ConneXium** switch tool to configure the ports for the Ethernet-managed switch (NES27100).

The following installation requirements apply in respect of all software packages:

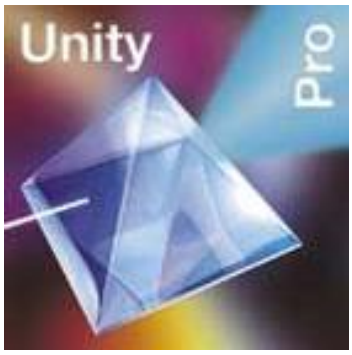
- Operating system: Windows 2000 (SP1 minimum) or Windows XP
- Required hard drive memory: At least 2.4 GB, 4.4 GB recommended
- RAM: At least 512 MB, 1024 MB recommended
- Processor: Pentium III or higher with min. 800 MHz, 1.2 GHz recommended
- Interfaces: Serial interfaces as a minimum, USB recommended in addition

Additional software:

- Internet Explorer 5.5 or higher

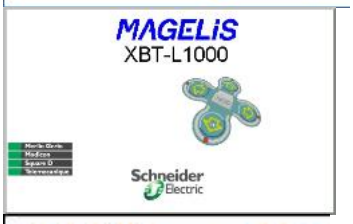
The software tools have the following default install paths:

- Unity Pro
  C:\Program Files\Schneider Electric\Unity Pro



- Vijeo Designer
  C:\Program Files\Schneider Electric\VijeoDesigner

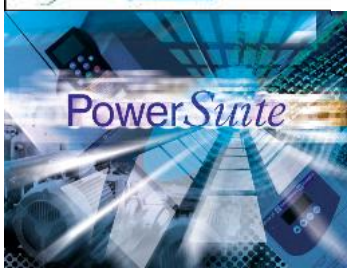
- Magelis XBT L1000
  C:\Program Files\Schneider Electric\XBT-L1000



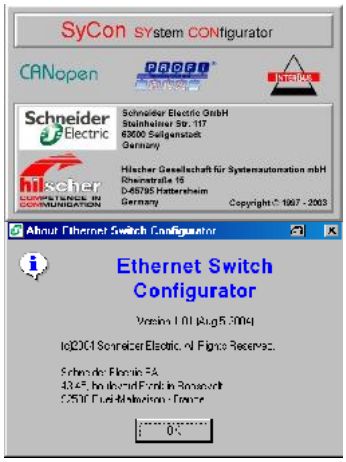
- Advantys configuration software
  C:\Program Files\Schneider Electric\Advantys

- PowerSuite ATV31
  C:\Program Files\Schneider Electric\PowerSuite.Launch

- PowerSuite ATV71
  C:\Program Files\Schneider Electric\PowerSuite Launch ATV71



- SyCon
  C:\Program Files\Schneider\SysCon



- ConneXium switch configurator
  .....C:\Program Files\Schneider Electric\Ethernet Switch Configurator 1.01\

Communication

General

PLC-configured I/O scanner functions are used to transmit data to and from the PLC. The HMIs read/write their data automatically.

The methods of communication below are used between devices:

- Modbus/TCP
- Webserver
- CANopen
- Serial Modbus
- Parallel cabling

Modbus/TCP Ethernet connection is used between the PLC and the main HMI (Magelis graphic terminal). The Ethernet cable is used either for connection via a hub or switch or for a direct connection with a crossed Ethernet cable.

Other, remote HMIs (Magelis graphic and text terminals) are operated either directly via Ethernet or at the Modbus interface on the STB island.

- An additional Ethernet port, which can be used to exchange data with other systems (other PLCs, data acquisition systems, etc.), can also be provided as an option on the PLC. This can also be used as a programming interface.
- In addition to the serial interfaces, the Magelis XBTG2330 terminals used also have an integral Ethernet port. The HMI is then connected directly to the MB/TCP Ethernet via the RJ45 socket.
- The remote Advantys STB stations are connected directly to the MB/TCP Ethernet via RJ45 sockets. Advantys FTB I/O modules or Altivar 31 variable speed drives are connected to each of these STB islands via the CANopen extender. In addition, at three stations XBTN text displays are connected in series to the STB network interface module via Modbus.
- The ATV71 variable speed drives are connected directly to the MB/TCP Ethernet via RJ45 sockets.

Ethernet Transmission rates

Table showing the Ethernet data transmission rates for the products:

Product	Reference	Data Rate
Unity Premium CPU	TSXP572634	10Base-T/100Base-TX
Magelis XBTG mit Ethernet on board	XBTG2330	10Base-T
TF-Switch, 8x 10T, IP20	499NES18100	10Base-T/100Base-TX
TF-Switch, 7x 10T/100TX, IP20	499NES27100	10Base-T/100Base-TX
TF-Hub, 4-fach mit 100Mbit, IP20	499NEH14100	100Base-TX
ATV71	ATV71HU75N4	10Base-T/100Base-TX
Advantys STB-Ethernet-Station	STBNIP2212	10Base-T
Ositrack splitter box	XGSZ33ETH	10Base-T/100Base-TX

Web Servers

Web servers are integrated into the following products used in this application:

- TSX Premium TSXP572634M CPU with Ethernet integration
- Advantys STB NIP2212 IP20 I/O station
- Altivar ATV71 variable speed drive

Using Internet Explorer, you can access the web pages included in the above products to edit or view parameter settings or diagnostics data (for communication or device parameters).

Communications

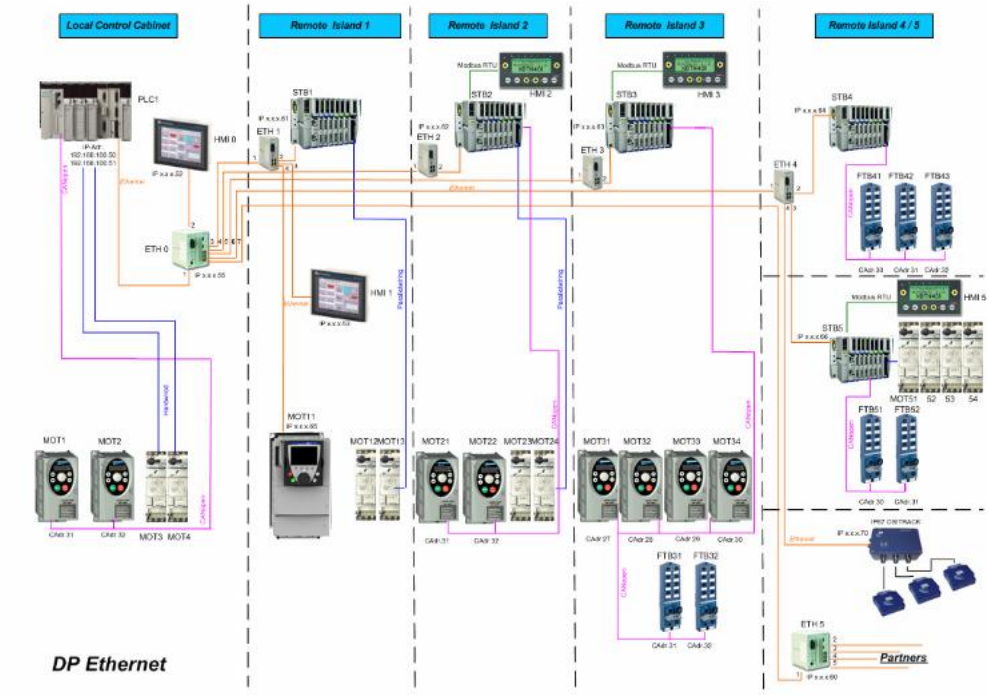
CANopen is used for communications in the main control cabinet between the variable speed drive (ATV31) and the PLC (TSX Premium). A CANopen bus cable must be connected between the PLC and each variable speed drive. The CANopen machine bus on the STB CANopen extender is also used. IP67 I/Os (Advantys FTB) and variable speed drives (ATV31) in the remote stations are connected to this.

- The ATV31 drives are connected to a CANopen junction box (VW3CANTAP2). Two ATV31 drives can be connected to the latter via a special cable (VW3CANRR1) with RJ45 connectors.

Modbus SL is used between the Advantys STB network interface module (NIM) and the text HMI.

Parallel cabling uses a pre-assembled cable to connect the STB I/O island to the motor starter. This rules out the possibility of cabling errors.

Station Overview



Topography

The Modbus TCP, CANopen and Modbus bus systems are used in this application.

The devices below are networked via **Modbus TCP**:

- TSX Premium, **PLC1** with IP address 192.168.100.50
- Magelis main panel XBT-G, **HMI 0**, IP address 192.168.100.52
- Magelis sub-panel XBT-G, **HMI1**, IP address 192.168.100.53
- Ethernet-managed switch NES, **ETH0**, IP address 192.168.100.55
- Ethernet hub NEH, **ETH1**, **ETH2**, **ETH3**, **ETH4**,
- Ethernet-managed switch NES, **ETH5**, IP address 192.168.100.60
- ATV71 variable speed drive, **MOT11**, IP address 192.168.100.65
- Advantys STB island 1, **STB1**, IP address 192.168.100.61
- Advantys STB island 2, **STB2,** IP address 192.168.100.62
- Advantys STB island 3, **STB3,** IP address 192.168.100.63
- Advantys STB island 4, **STB4,** IP address 192.168.100.64
- Advantys STB island 5, **STB5,** IP address 192.168.100.66

The devices below are networked via **CANopen**:

- Two Altivar ATV31 drives (**MOT1**, **MOT2**) in the main cabinet on the CANopen master CPP110 on the PLC, → bus addresses 31, 32
- Two (**MOT21**, **MOT22**) or four Altivar ATV31 drives (**MOT31**, **MOT32**, **MOT33**, **MOT34**) in the remote cabinets on the CANopen extender on STB island 2, STB2, and STB island 3, STB3, →bus addresses 31, 32 or 27 to 30.
- Two (**FTB31**, **FTB32**) or three Advantys FTB I/O modules (**FTB41**, **FTB42**, **FTB43**) in the remote cabinets on the CANopen extender on STB island 4 (STB4) → bus addresses 31, 32 or 31 to 33.

The devices below are interfaced via **Modbus**:

- Three Magelis HMI XBT-N (**HMI2**, **HMI3**, **HMI5**) on the Modbus interfaces on STB islands 2, 3 and 5, bus address 1 in each case.

Two TeSysU direct starters (**MOT2**, **MOT3**) in the main cabinet are connected by **direct wiring**.

TeSysU direct starters in the remote cabinets are connected to the STB islands by **direct wiring** (**MOT12, MOT13 →STB1, MOT23, MOT24 →STB2, MOT51, MOT52, MOT53, MOT54 →STB5)**

Ethernet IP-Addresses

The devices need a network identifier in order to communicate via Ethernet. This is the IP address, with a 4x3-digit number (digit groups separated by dots).
The first three groups of digits in the IP address represent the network, while the 4th group represents the actual device.

Example: 192.168.100.61 → STB island address 61 in the local network for machine 192.168.100.
In order for a "universal" IP address to be assigned to each Ethernet device, however, the user needs to have an initial point of access. This is provided by the MAC address on the chip installed by the manufacturer. The MAC address is printed on every Ethernet device label.

The following methods can be used to assign an IP address to an Ethernet device:

- **Device allows IP assignment via its own operating menu (e.g., ATV71)**
- **Device supports BOOTP or role name functionality (e.g., STB)**
- **Device supports DHCP server functionality (e.g., high-end Unity CPU)**
- **Device has a WebServer (e.g., STB, ATV71, ETY, NOE, NES)**
- **Device allows parameter setting via a terminal program (e.g., NES)**

Not all Schneider Electric Ethernet devices support all of the above methods.

There is no standard, generic method for assigning IP addresses to Ethernet devices. You must therefore consult the appropriate product documentation.

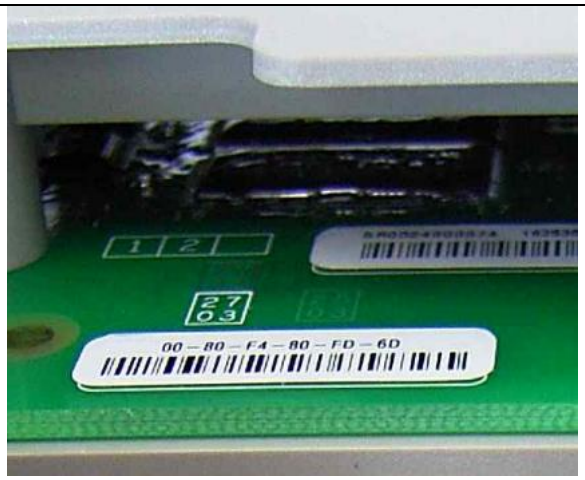
MAC-Addresses (hex)

Every Ethernet device has a unique manufacturer address (MAC address).

Some examples are shown below:

Manufacturer code: 80F4 hex = TELEMECANIQUE

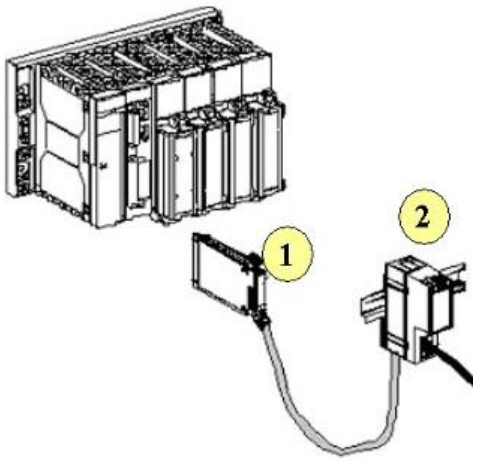
MAC address 00 80 F4 80 FD 6D



ATV71 Ethernet Option Card

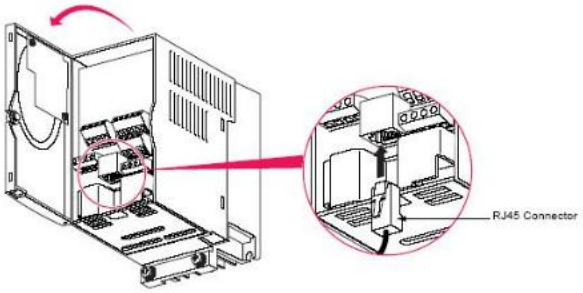
Ethernet Switch NES27100

MAC address
00 80 63 1A E6 04

TSX Premium PLC **TSX P57 2634M** 1) Serial link between PC with Unity Pro and PLC (TER/AUX), using cable TSX PCX 1031 2) The Ethernet interface is used for the IO scanner and other PLC services. It can also be used as a programming interface (Unity Pro). A switch or hub and an Ethernet cable are required to establish an Ethernet connection. **Programming** For the purpose of programming, cable TSX PCX 1031 is used to establish a connection between the serial interfaces on the PC and PLC. Alternatively, an Ethernet link can be used, once the Ethernet port has been configured.	
CANopen master **TSX CPP110** The TSX CPP 110 CANopen interface card (1) is inserted into the second PCMCIA card slot on the Premium CPU. The outgoing bus from this card terminates in a connector (2) for the outgoing CANopen bus. The connector is mounted on a top-hat rail and has a 9-pin sub D socket.	
Communication cable PC <--> PLC PCX1031 Default setting**: 3** Programming setting**:2**	

ATV31

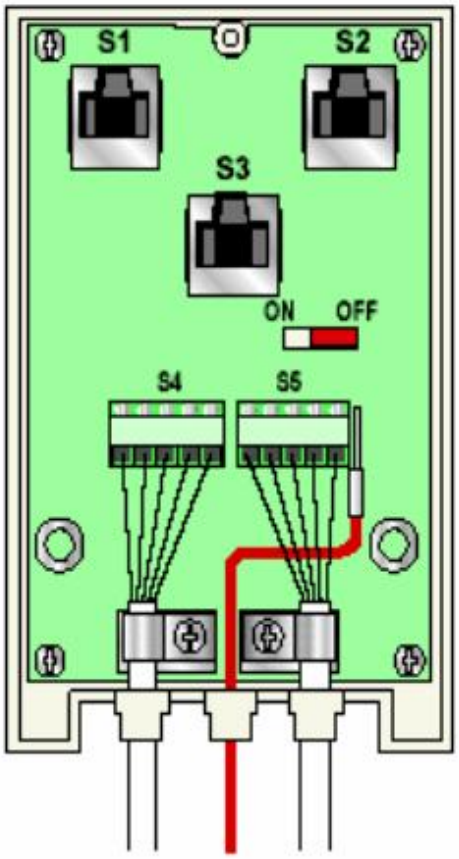
CANopen connection (RJ45) on ATV32 variable speed drive



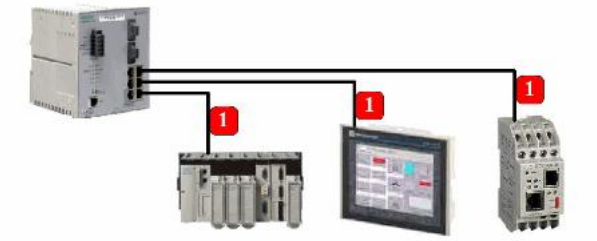
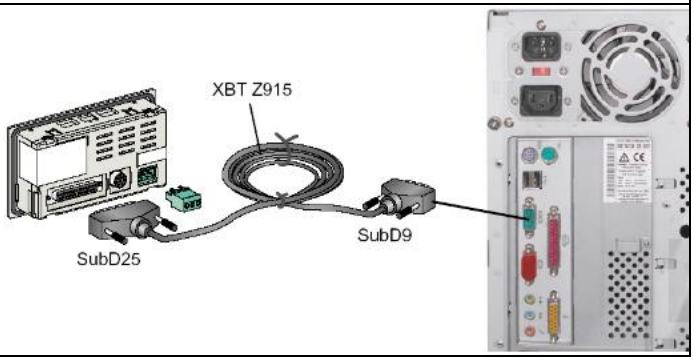
ATV31
VW3CANTAP2

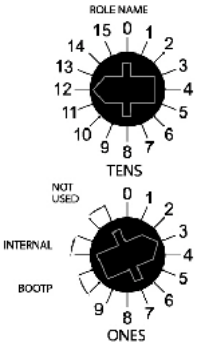
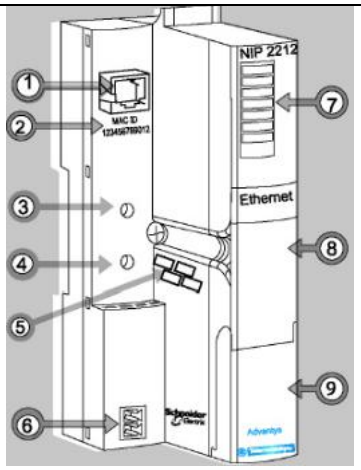
The connection to the CANopen bus is established using junction box VW3CANTAP2 and cable VW3CANRR1.

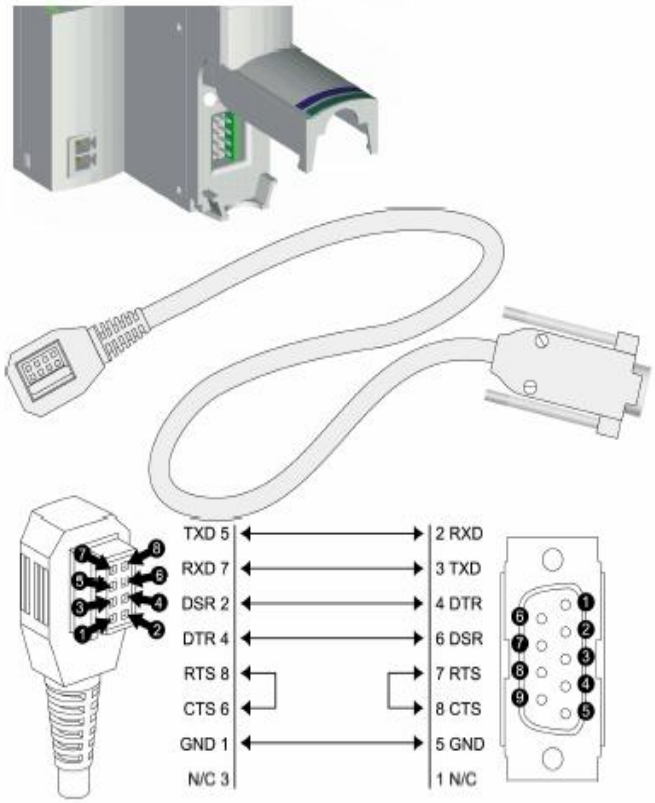
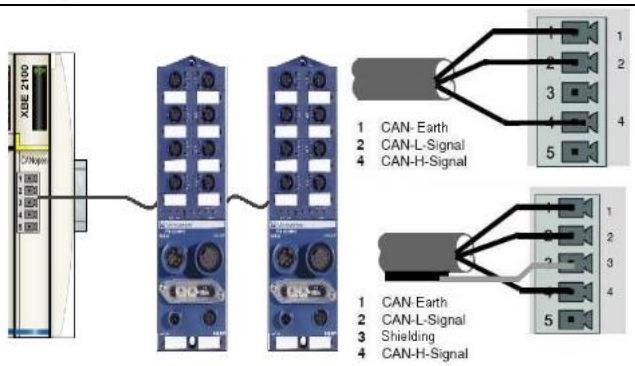
In addition, the incoming and outgoing CANopen cables must each be connected to the junction box.

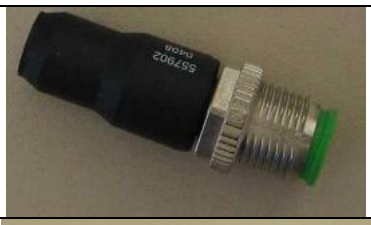
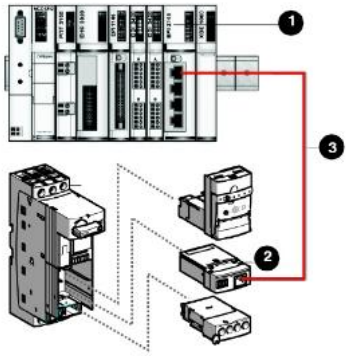


Pin	Signal	Description
1	GND	Ground
2	CAN_L	CAN_L bus line
3	SHLD	Optional shield
4	CAN_H	CAN_H bus line
5	(V+)	Optional supply (1)

ATV71 **VW3A3310** **Ethernet card** The connection to the Ethernet is established using the ATV71 option card via the RJ45 connection.	
Magelis **XBT-G2330** The connection to the PLC is made via Ethernet cable 490NTW00003. There is an RJ45 socket on the side of the HMI for this purpose.	
Ethernet cabling **Switch** **499NES27100** Examples	 **1: Ethernet patch cable (CAT-5) with RJ45 connectors**
Magelis XBTN HMI programming cable **XBT Z915** for programming the HMI (XBTN) via the serial interface on the PC, with HMI software (XBT-L1000).	

Advantys STB HMI XBT-N data cable **XBT Z988**	 The XBTZ988 data cable is required to connect the local HMI (D-sub, 25-pin) to the Advantys STB (CFG port). **This allows the distributed I/O data on the fieldbus island to be displayed on site directly, without a PLC. Data can also be exchanged between the HMI device and the PLC via the so-called HMI/PLC data area.**
Advantys STB Ethernet connection **STB NIP 2212**	  1 Ethernet interface 2 MAC ID 3 Top rotary switch 4 Bottom rotary switch 5 Space to enter the IP address 6 Power supply interface 7 LED panel 8 Card slot for the memory card 9 Cover for CFG port
	The two NIM rotary switches (3/4) can be used to define how an IP address is assigned. There are two options for allocation: 1. Via a central address server (e.g., in the PLC). The MAC address (BOOTP) or “ROLE NAME” is used for identification. 2. Or the internal IP address (INTERNAL) is used.

Advantys STB Programming cable **STB XCA 4002** for programming the Advantys via the serial interface from the PC (with Advantys software). Alternatively, the connection can be made via Ethernet.	
Advantys STB CANopen extension card **STB XBE 2100**	
Advantys FTB CANopen bus cable **FTX CN32xx** xx stands for the varying lengths of cable.	 **FTXCN32xx** cables are used for the CANopen connection. Provided that two FTBs are directly connected to one another, the cables can be used as they are. If, on the other hand, a connection is made to the Advantys STB, one of the connectors must be removed and the strands attached separately.

Advantys FTB CANopen bus terminating resistor **FTX CNTL12**	
Advantys FTB Power supply cable **FTX DP22xx** xx stands for the varying lengths of cable.	
TeSysU - Advantys Connection cable **LU9R10** Used to connect the Advantys STB EPI2145 module.	 1 - Advantys module STB EPI2145 *) 2 - Communication module LUF C00 (parallel connection) 3 - Connection cable LU9410 *) The STB EPI 2145 is an Advantys STB special module that establishes parallel cabling between an Advantys STB and up to four reversible TeSys U units. Each of the four channels on the STB EPI 2145 comprises two outputs (start forwards and start backwards) and three inputs (ready for operation, run message and error status). This combination precludes cabling errors.

Implementation

Introduction

The implementation chapter describes all the steps necessary to initialise, to configure, to program and start-up the system to achieve the application functions as listed below.

Function

1. With the exception of the safety functions, the entire application is controlled via the PLC. For this purpose, in the PLC, the input signals, the information from the drives and the inputs are analyzed via the HMI and the drives are controlled and the outputs set on the basis of this data.

2. Independently of the PLC, the application features two Category 3 safety circuits for the emergency-off functions. When tripped, these disconnect the power supply to the drives and PLC outputs and inform the PLC accordingly.

3. Each type (ATV31 and ATV71) has a separate state machine in the PLC to control the drives. The state machine converts motion commands, e.g., "Turn left at 1400 rpm" or "Acknowledge error", into a control signal for the drives. The state machine is based on the DriveCom profile in all cases (to ensure that the state sequence remains the same for all drive types). However, as the requirements placed on the drives are not always the same and the functions to be implemented vary, the following functions are supported:

    - ATV31: Travel at two different velocities and in two directions
    - ATV71: Travel at various speeds, parameter transfer

4. As the ATV71 can run without the DriveCom state machine in some settings, direct control via the bus, for example, is supported for an ATV71.

5. The application can run in automatic mode, which is controlled via a sequencer and features one sequence for a variety of drive functions.

6. As well as displaying up-to-date information about the application, the HMI provides access to application controls. This usually involves switching between manual and automatic mode. The drives can be controlled individually in manual mode.

The PLC program, therefore, represents a framework for a typical application but without simulating any of the actual functions of a specific machine.

When the power supply is switched on via the master switch, the variable speed drives, motor starters, PLC and Ethernet switch/hub initialize. After initialization they assume a basic status, i.e., the motors are still switched off, and they await inputs from the operator. The operator and display terminal also goes through an initialization phase when it is turned on and then switches to a general status display, which among other things signals the availability of communication to the PLC.

Function ctd.

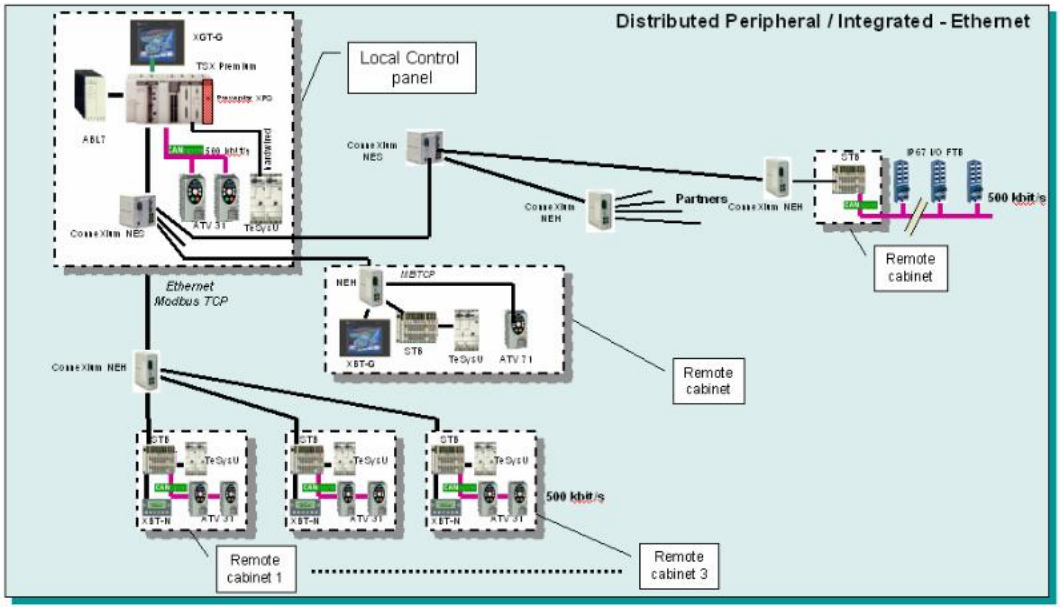
Startup instructions and description of functions:

1. Switch on all fuses and motor circuit-breakers
2. Acknowledge emergency-off signals
3. Switch on the master switch
4. Establish a safe status and acknowledge
5. You can now select MANUAL or AUTOMATIC mode on the main screen

Manual: On the TEST screen the individual motors can be moved independently of one another.

Automatic: The various speed parameters can be set on the SETTINGS screen. The default parameters can be set using the DEFAULT switch.

Functional Layout



Procedure

Proceed as follows to optimize the setup time of the individual products:

1. Define the communication addresses for the individual devices (IP addresses for Ethernet and CANopen addresses for slaves)
2. Parameterize the ATV31 and ATV71 drives (bus parameters, motor parameters, control profile).
3. Parameterize the remote I/O stations (IP20 STB, IP67 FTB)
4. Use the SyCon software to parameterize the CANopen bus (parameters, PDO configuration and exchange, SDO for bus start)
5. Use the Unity Pro software to parameterize the MB/TCP Ethernet bus (bus parameters, I/O scanner)
6. Program the PLC (basic configuration, communication, variables, blocks for drives, manual mode, automatic mode).
7. Configure and program the HMI (data areas, communication, data display, operator controls).

Proceeding in the sequence described above will ensure that the relevant information can either be imported directly or entered manually from the previous action.

- Control program for PLC using *Unity Pro XL*
- Configuration of CANopen bus using *SyCon*
- Configuration of remote I/O stations (Advantys STB/FTB) using *Advantys Config Tool*
- Configuration of operator and display terminals (XBT-G) using *Vijeo Designer*
- Configuration of operator and display terminals (XBT-N) using *XBT-L1000*
- Configuration of variable speed drives (ATV31) using *Power Suite - optional*
- Configuration of variable speed drives (ATV71) using *Power Suite Launch ATV71 - optional*
- Configuration of Ethernet switch 499NES27100 using DIP switches + *ConneXium Switch Tool*
- Configuration of Ethernet hub 499NES18100 using DIP switches
- Configuration of Ethernet hub 499NEH10410 using DIP switches
- Configuration of motor starters (using switches)

Communication

Introduction

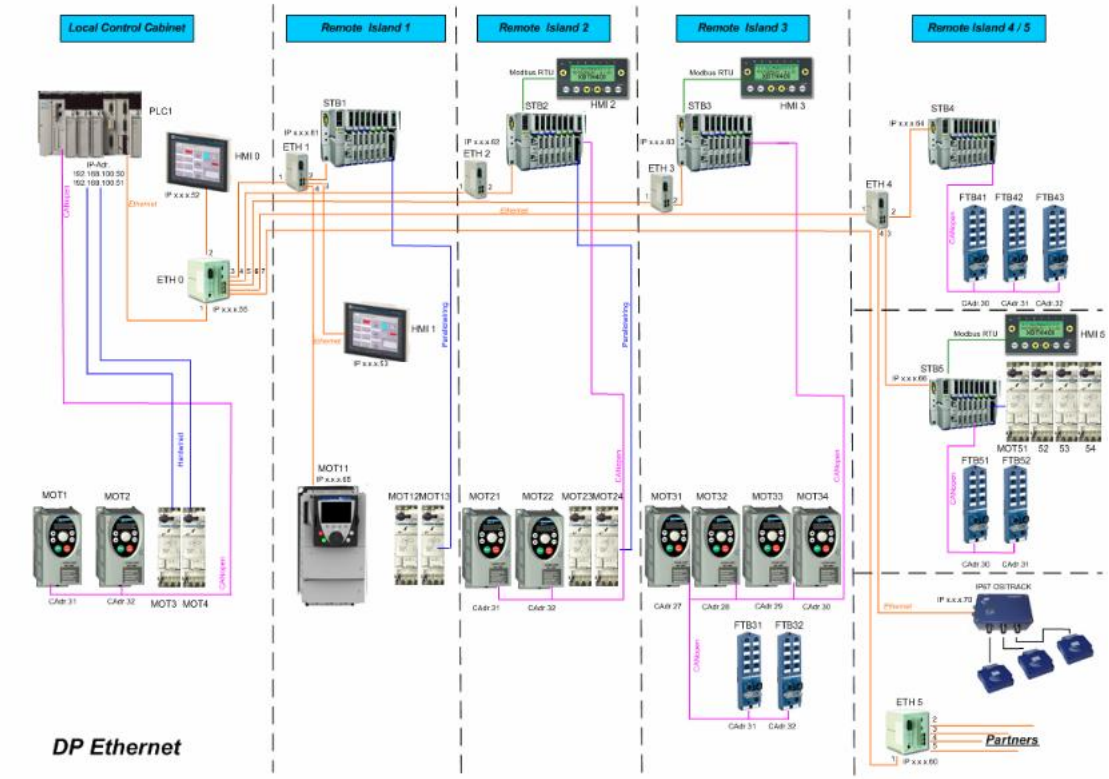
This chapter describes the data passed via the communications bus (e.g. Modbus TCP and CANopen) that is not bound directly with digital or analog hardware.

The list contains:

- The device links
- Direction of data flow
- symbolic name and

PLC-configured I/O scanner functions are used for sending data to and from the PLC. The HMIs read/write their data automatically.

Device Links



Device List

The Modbus TCP, CANopen and Modbus bus systems are used in this application.

The devices below are networked via **Modbus TCP**:

- TSX Premium **PLC1**
- Magelis main panel XBT-G **HMI0**
- Magelis sub-panel XBT-G **HMI1**
- Ethernet-managed switch NES **ETH0**
- Ethernet hub NEH **ETH1**, **ETH2**, **ETH3**, **ETH4**
- Ethernet-managed switch NES **ETH5**
- ATV71 variable speed drive **MOT11**
- Advantys STB island 1 **STB1**
- Advantys STB island 2 **STB2**
- Advantys STB island 3 **STB3**
- Advantys STB island 4 **STB4**
- Advantys STB island 5 **STB5**

The devices below are networked via **CANopen**:

- Two Altivar ATV31 drives (**MOT1, MOT2**) in the main cabinet on the CANopen master CPP110 on the PLC
- Two (**MOT21, MOT22**) or four Altivar ATV31 drives (**MOT31, MOT32, MOT33, MOT34**) in the remote cabinets on the CANopen extender on STB island 2, **STB2**, and STB island 3, **STB3**
- Two (**FTB31, FTB32**) or three Advantys FTB I/O modules (**FTB41, FTB42, FTB43**) in the remote cabinets on the CANopen extender on STB island 4 (**STB4**).

The devices below are interfaced via **Modbus**:

- Three Magelis HMI XBT-N (**HMI2, HMI3, HMI5**) on the Modbus interfaces on STB islands 2, 3 and 5

Two TeSysU direct starters (**MOT2, MOT3**) in the main cabinet are connected by **direct wiring**.

TeSysU direct starters in the remote cabinets are connected to the STB islands by **direct wiring** (**MOT12, MOT13 → STB1, MOT23, MOT24 → STB2, MOT51, MOT52, MOT53, MOT54 → STB5**).

General Addressing

The PLC example program uses different hardware, discretes and memory words. The following list contains keys to aid the understanding of the addressing system used.

Type	Address	Comment
Digital Inputs	%Ir.m.x	Digital inputs are hardware orientated: r as Rack number, m as slot number, x as Input number. E.g.: Emergency Off response at %I0.3.0
Digital Outputs	%Qr.m.x	Digital outputs are hardware orientated: r as Rack number, m as slot number, x as output number E.g.: Manual Mode Indicator at %Q0.5.1
Analog Inputs	%IWr.m.c	Analog inputs are hardware orientated: r as Rack number, m as Slot number, c as channel number. E.g.: Emergency Off response at %IW0.3.0
Analog Outputs	%QWr.m.c	Analog outputs are hardware orientated: r as Rack number, m as Slot number, c as channel number. E.g.: Emergency Off response at %QW0.3.0
CANopen Inputs	%MW0 to %MW31	CANopen-Inputs are written as Memory Words, single bits can be accessed as %MWi.x. E.g.: 2nd ATV Status word at %MW2
CANopen Outputs	%MW100 to %MW131	CANopen-Outputs are read as Memory words, single bits can be accessed as %MWi.x. E.g.: 3rd. ATV control word at %MW104
Data for Visu	%MW200 to %MW299	Data for the visualisation is stored in memory words. Single bits can be written using the function BIT_TO_WORD E.g.: Motor speed at %MW220
Data from Visu	%MW300 to %MW399	Data from the visualisation is stored in memory words. Single bits can be extracted using the function WORD_TO_BIT E.g.: Motor speed at %MW220
CANopen Status	%CHr.m.c	CANopen Status data can be read from the data structure T_COM_CPP110 (IODDT). Channel-Address: r as Rack number, m as Slot number, c as channel number. E.g.: Status CANopen %CH0.1.1

HMI

Introduction

In this application, two Magelis XBT-G 2330 HMIs connected to the PLC via Ethernet are used.

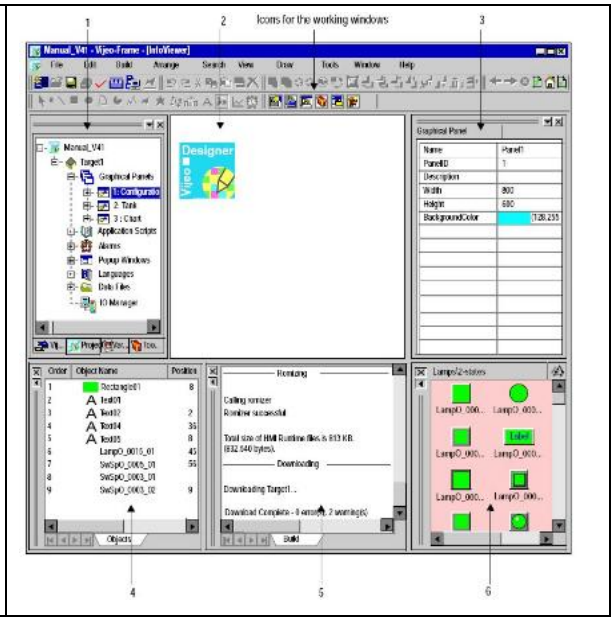
Three Magelis XBTN401 terminals connected to the Advantys STB islands are also used. They are described in a separate chapter later on.

Vijeo Designer software is used to configure and program the graphic terminal. The steps to be taken in order to create and upload a program are described on the following pages.

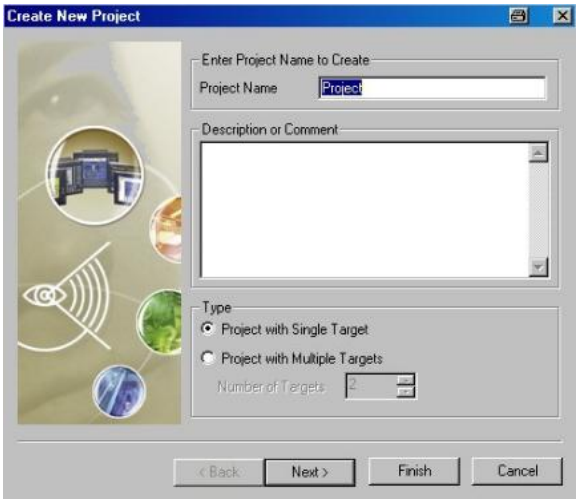
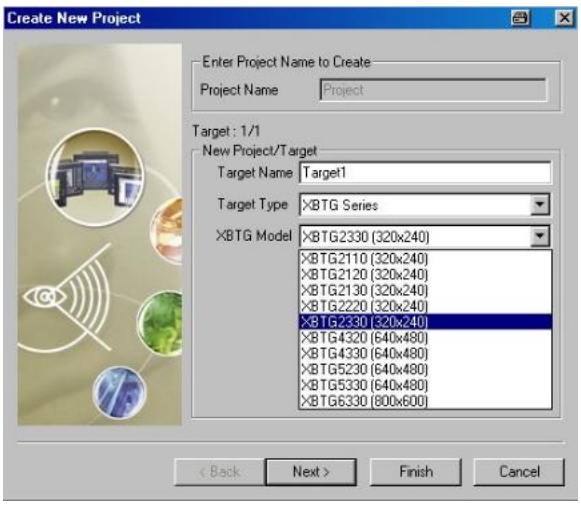
Setting up the HMI is done as follows:

- Vijeo Designer function overview
- Create new project (specify platform, hardware, communication).
- Communication settings
- Set up new variables
- Set up animations
- Check the project and download it
- Overview of example project

Function Overview

1	The Vijeo Designer environment consists of the following elements: 1 Navigator 2 Info Display 3 Inspector 4 Data List 5 Feedback Zone 6 Toolbox	

Creating a New Project

1	When Vijeo Designer starts up, a selection window appears. Select **Create new Project** and **Next**. The following screens appear automatically.	
2	Enter a **project name** for the application and an optional comment.	
3	Next, select the target device used and enter a logical name for it. Example project: • **Target Name: Target1** • **Target Type: XBTG Series** • **XBTG Model: XBT-G2330**	

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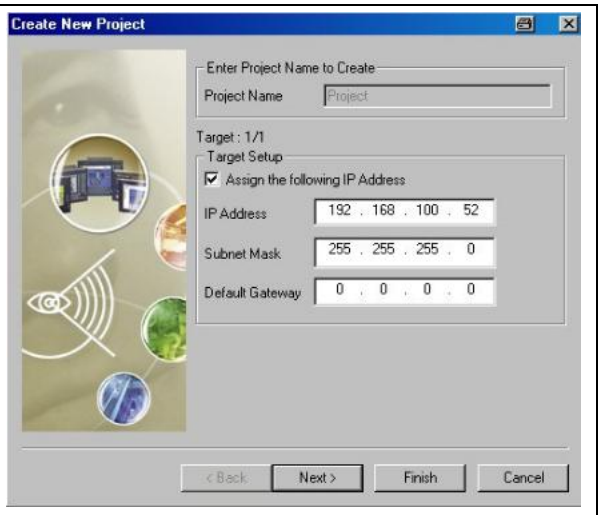
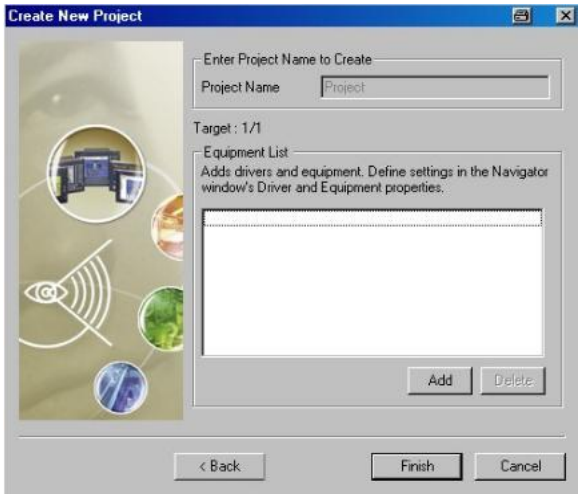
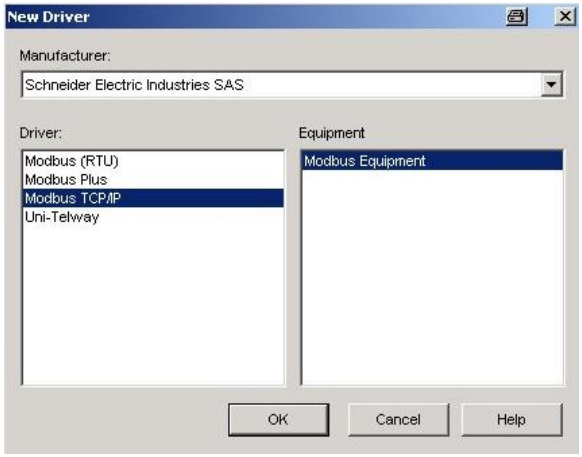
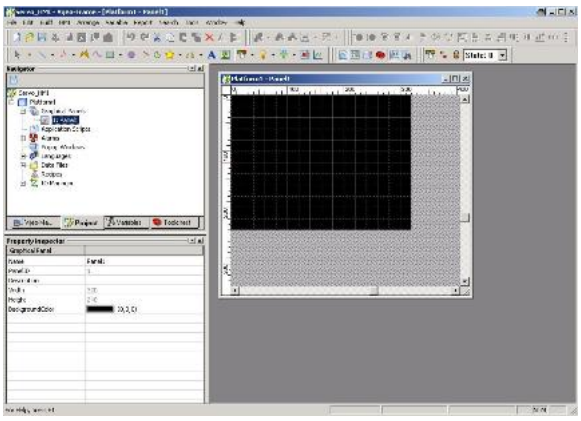
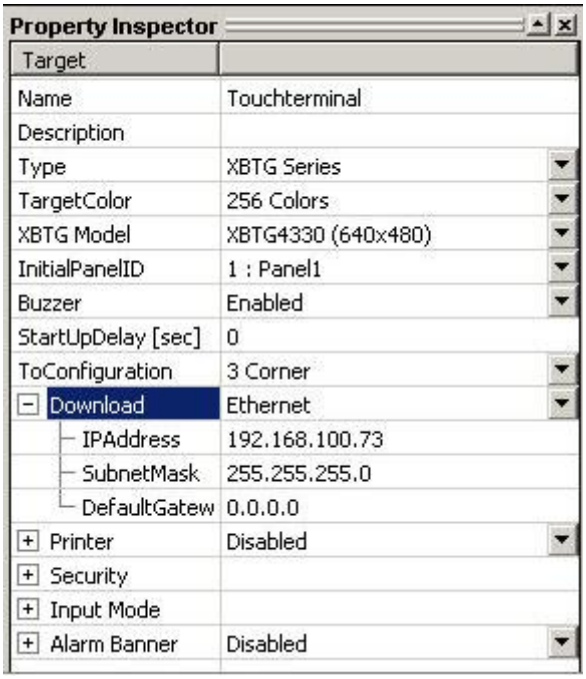
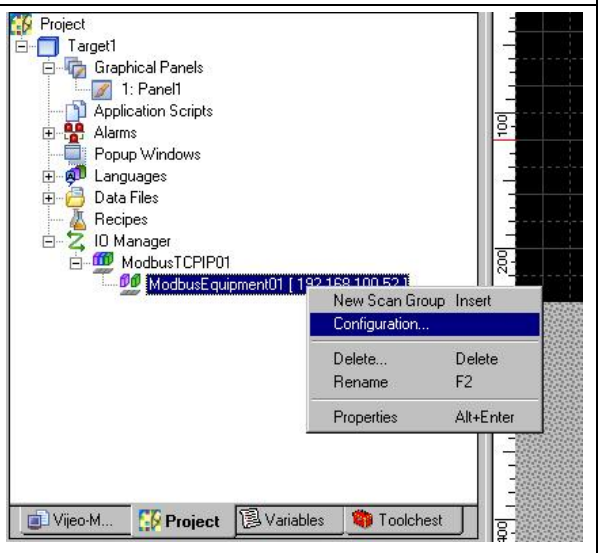
Creating a New Project Ctd.

4	In order to use the device's Ethernet interface, you need to enter the IP address, subnet mask and, if applicable, the gateway.	
5	In order to be able to exchange data with the control system, the Magelis HMI requires a communication driver. To set one up, click the **Add** button.	
6	Select **Schneider Electric Industries SAS** from the list under Manufacturer; for communication with the PLC, you will then be able to select the **Modbus TCP/IP** driver as **Modbus TCP/IP / Modbus Equipment** under Equipment. Once you have selected a communication driver, you can complete the creation of the new project by clicking the **OK** button.	

Communi-cation Settings

1	Once you have created the project, Vijeo Designer will display the workspace as described above with an empty edit screen on the right-hand side.	
2	To download the project, change the settings to Ethernet. To do this, right-click with the mouse on the target in the Navigator and select **Download** in the **Property Inspector**. In order that the project can be transferred to the Magelis HMI, you will need to select **Ethernet** as well as the **IP address** and the **subnet mask**.	
3	The interface parameters must be defined for the Modbus TCP/IP driver in order to communicate with the PLC. Right-click with the mouse on **ModbusEquipment01** and select **Configuration…**.	

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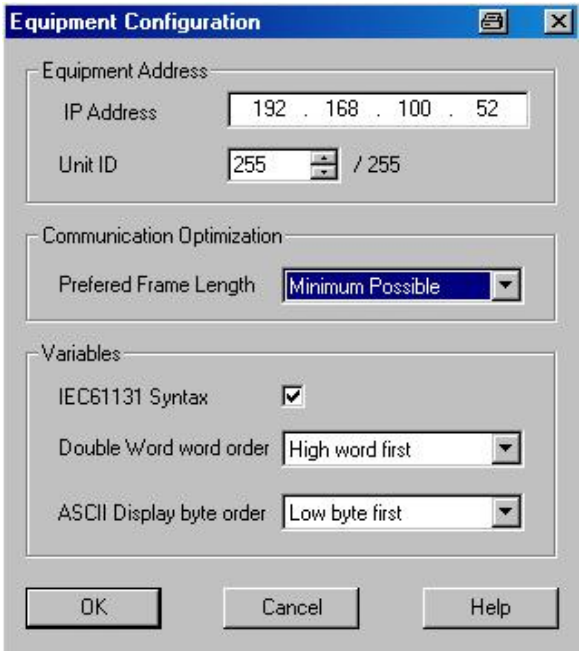
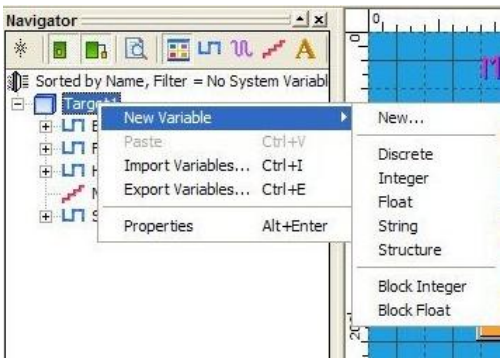
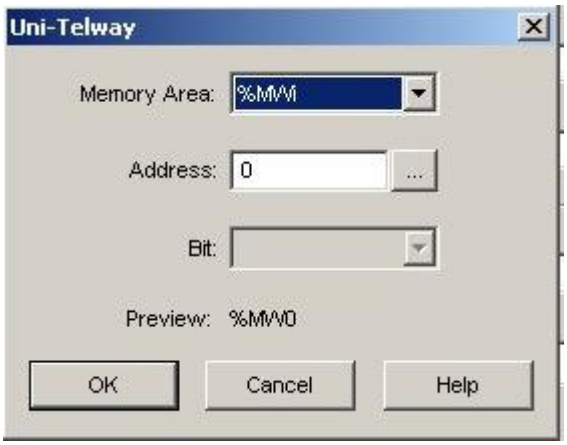
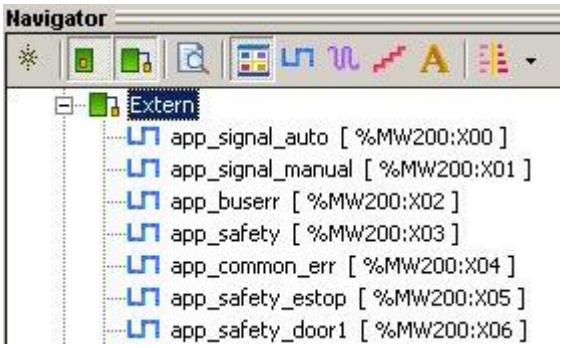
Communi-cation Settings Ctd.

4	The interface parameters required for successful **device configuration** are: • **IP address** • **Unit ID** • **Communication optimization** • **Variable** • **IEC61131 syntax** The configuration must tally with the PLC port.	

Creating Variables

1	To create new variables in the Navigator, select the **Variable** tab at the bottom of the screen. Right mouse click on the project name displays a Popup-menu. Click on **New Variable→New..** .	
2	To create variables, the following information must be entered: • **Variable Name** • **Data Type** • **Data Source (External)** • **Device Address**	
3	All memory types on the PLC can be addressed (in addition to flags (%M), words (%MW), double words (%MD), and floating points (%MF), also system bits (%S) and words (%SW), and constant bits and words (%K, %KW)). All data to be displayed on the Viewer must be transferred to one of these types.	
4	The variables created are displayed in the **Navigator**, along with their names and addresses. In the example project, all variables (even Boolean variables) are assigned to flag words (the "Visu" section in the PLC program is associated with this).	

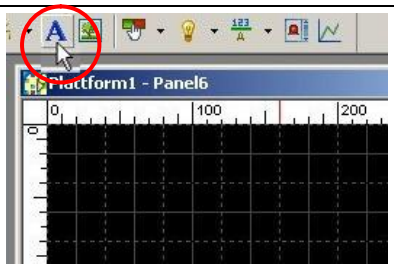
Creating Images

The process for creating animations on screens will now be described using an example text. The functions are similar for other animation elements.

1 **Example: Enter text**

Selection from the menu bar.

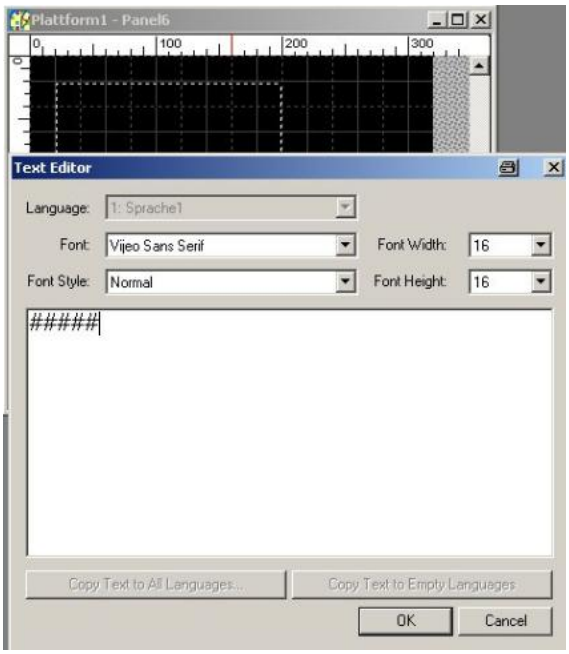
Various icons and elements are available in the menu bar and the toolbox.



2 **Example: Edit text**

You can define:

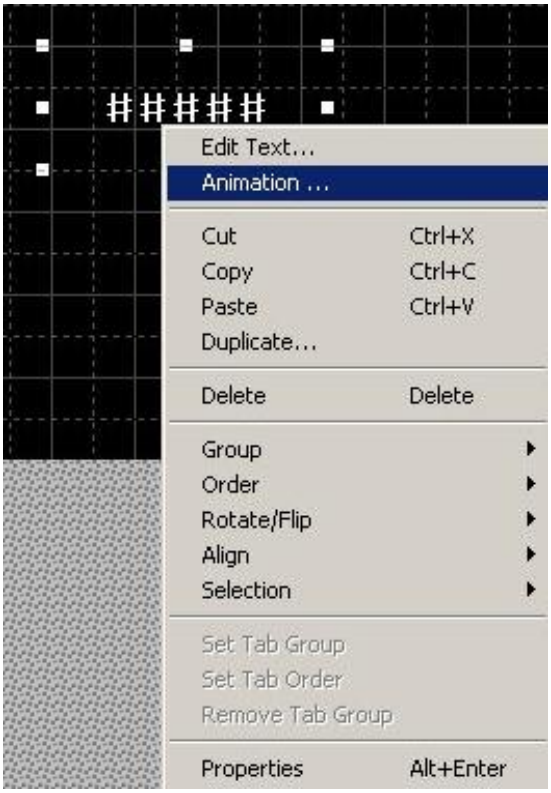
- **Font size**
- **Text content**
- **Font style**
- **etc.**



3 **Example: Animate text**

Start by selecting the text element and calling up the dialog box by right-clicking with the mouse. Next select the **Animation** function.

You can also do this via the Properties screen (described above).



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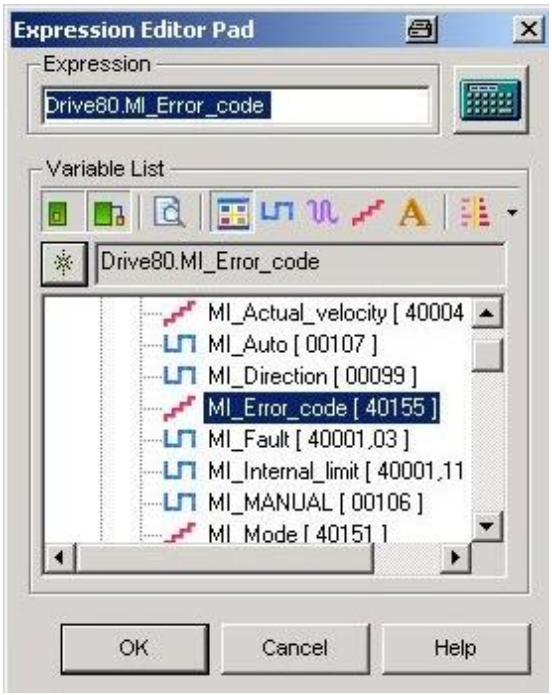
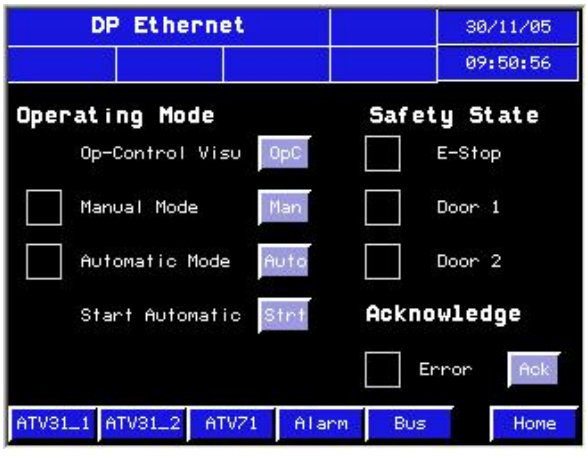
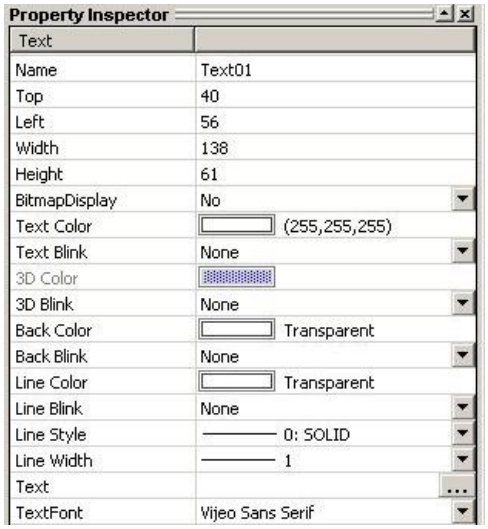
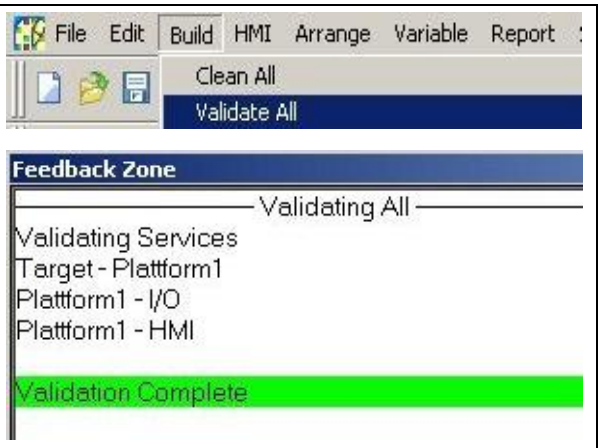
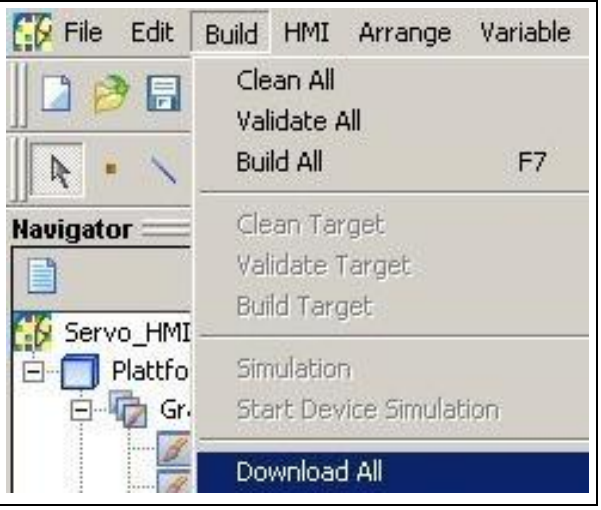
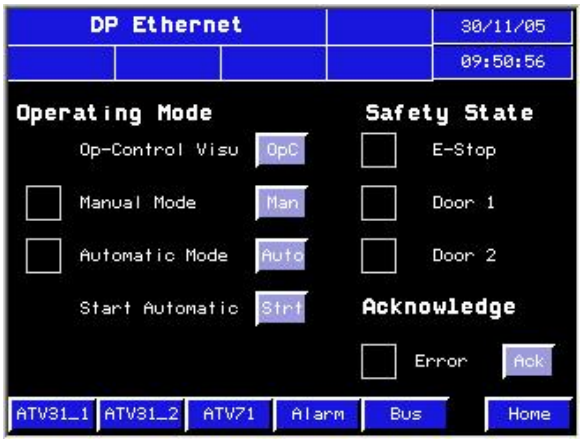
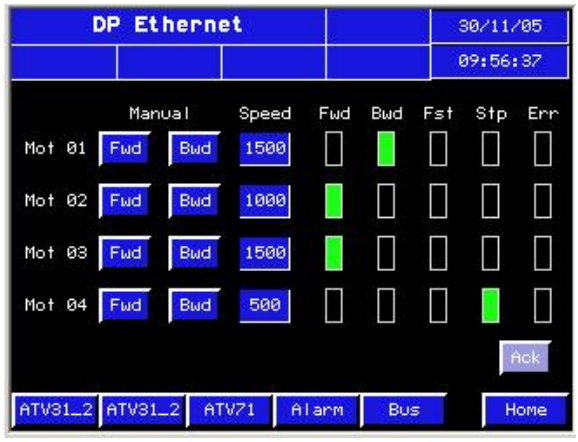
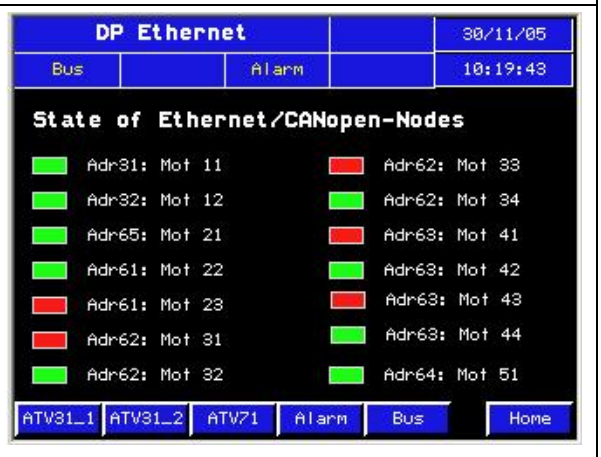
4	**Animation properties:** • **Color** • **Position** • **Value** • **Visibility** After activation you can select a variable for the value animation and the display format.	
5	The variable to be animated can be entered directly in the line or looked up by selecting the (icon) at the end of the line (light bulb). A variable name that has been entered but not recognized appears in red. Additional functions, e.g., value inversion, can be executed by clicking on the **calculator icon**.	
6	The display opposite shows the completed startup screen in which the separate properties for animation and actions appear.	

7	**Property Inspector** Each animation element on the screen has its own Property Inspector (right-click with the mouse) via which all settings associated with the element can be viewed and modified.	

Download Project

1	Before being downloaded to the graphic HMI, the project must first be analyzed. To do this, select **Validate All** from the **Build** menu. The results are listed in the Feedback Zone.	
2	Select **Download All** under **Build** to transfer the application to the connected Magelis terminal. The connection selected at the outset (Ethernet) is used.	

Application Overview

1	The example application features a number of displays that can be selected by the user. The display opposite shows the main screen from where all other displays can be accessed. The application overview, providing access to error messages and safety indicators, as well as to the selection of the operating mode, also appears here. In principle, all screens are structured in the same way and all essential system status data appears in the header. You can switch from one screen to another by clicking the buttons in the footer.	
2	All drives can run in manual mode, controlled directly via the Viewer. To do this, you must switch to the relevant screen. There is one button for forward travel and another for reverse travel. For the ATV71, you can also specify a velocity and set ramps by clicking on the **Set** button. The status message and velocity display act as feedback.	
3	Other screens include a diagnostics display and an overview of the Ethernet bus nodes.	

PLC

Introduction

The PLC chapter describes the steps required for the initialisation and configuration and the source program required to fulfil the functions.. The Unity Pro and SyCon software tools are used for this. Proceed as follows to integrate the PLC:

- **Overview of address definitions**
- **Configure communications between CANopen and the master (SyCon)**
- **Create a new PLC project and select hardware (Unity Pro)**
- **Configure the inputs and outputs (Unity Pro)**
- **Configure CANopen communication (Unity Pro)**
- **Configure Ethernet communication (Unity Pro)**
- **Create application program (logic) (drives, manual mode, automatic mode).**
- **Create visualization interface.**
- **Connect to PLC and download program.**

Address Definition Overview

Various hardware addresses, as well as flags and flag words, are using in the PLC example program. To facilitate orientation, an overview of the addresses used appears below in list format.

Type	Address	Comment
CANopen inputs	%MWx to %MWxx	CANopen inputs are written to flag words; individual bits can be addressed via %MWi.x. Example: 2nd ATV status word %MW2
CANopen outputs	%MWxxx to %MWxxx	CANopen outputs are read by flag words; individual bits can be addressed via %MWi.x. Example: 3rd ATV control word %MW104
MB/TCP inputs	%MWxxx to %MWxxx	Modbus/TCP inputs are written to flag words; individual bits can be addressed via %MWi.x. Example: 2nd ATV status word %MW200
MB/TCP outputs	%MWxxx to %MWxxx	Modbus/TCP outputs are read by flag words; individual bits can be addressed via %MWi.x. Example: 3rd ATV control word %MW304
MB inputs	%MWxxx to %MWxxx	Modbus inputs are written to flag words; individual bits can be addressed via %MWi.x. Example: 2nd ATV status word %MW400
MB outputs	%MWxxx to %MWxxx	Modbus outputs are read by flag words; individual bits can be addressed via %MWi.x. Example: 3rd ATV control word %MW454
Data for Viewer	%MWxxx to %MWxxx	Data for Viewer is written to flag words. Individual bits are written via block BIT_TO_WORD. Example: Motor velocity %MW520

Data from Viewer	%MWxxx to %MWxxx	Data from Viewer is read by flag words. Individual bits are extracted via block WORD_TO_BIT. Example: Motor velocity %MW620

Drive Address Definition Overview

Data for drives which communicate via CANopen or MB/TCP bus devices is addressed via flag words. An overview of PLC addresses, data length (in words) and content appears in the table below.

Device	Node	Addresses	No.	Data
ATV31	MOT1	%MWx	2	Status, actual velocity
		%MWxxx	2	Control word, setpoint velocity
ATV31	MOT2	%MWx	2	Status, actual velocity
		%MWxxx	2	Control word, setpoint velocity
ATV71	MOT11	%MWx	4	Status, actual velocity, ramps
		%MWxxx	4	Control word, setpoint velocity, ramps
ATV31	MOT21	%MWx	2	Status, actual velocity
		%MWxxx	2	Control word, setpoint velocity
ATV31	MOT22	%MWx	2	Status, actual velocity
		%MWxxx	2	Control word, setpoint velocity
ATV31	MOT31	%MWx	2	Status, actual velocity
		%MWxxx	2	Control word, setpoint velocity
ATV31	MOT32	%MWx	2	Status, actual velocity
		%MWxxx	2	Control word, setpoint velocity
ATV31	MOT33	%MWx	2	Status, actual velocity
		%MWxxx	2	Control word, setpoint velocity
ATV31	MOT34	%MWx	2	Status, actual velocity
		%MWxxx	2	Control word, setpoint velocity

Configuring Communication CANopen - Master (SyCon)

Introduction

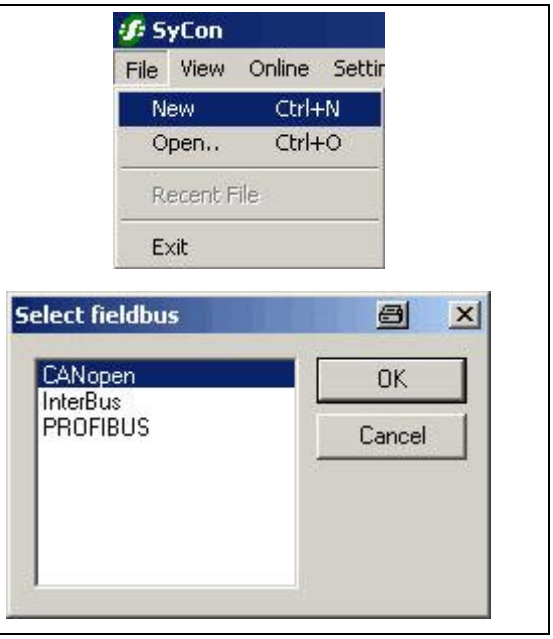
The **SyCon** software is used to configure the CANopen bus on the PLC. The individual devices are identified as devices on the bus, then addresses are assigned and the master function is assigned to the Premium PLC.

Subsequent steps configure the data for the individual devices to be transferred during operation (PDO) and if necessary specify their configuration (SDO). Finally, the general bus settings are entered, e.g. specifying the baud rate.

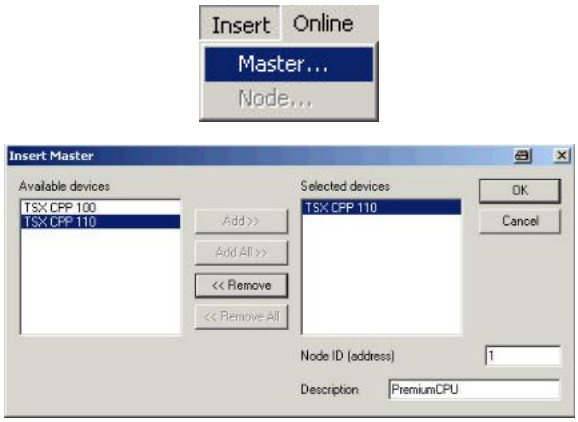
Proceed as follows to establish communications between CANopen and the PLC (CANopen master):

- **Create a New Project**
- **Add CANopen Master devices (CPP110)**
- **Add CANopen node devices (Altivar 31)**
- **Configure Altivar 31 devices**
- **Define CANopen bus parameters**
- **Save the project (create *.co)**

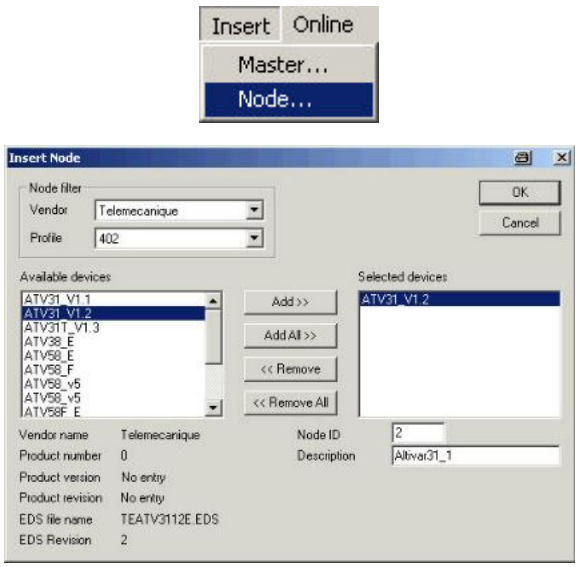
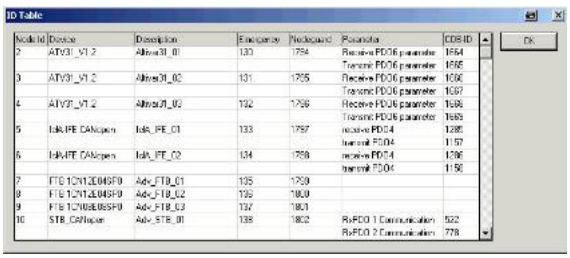
Creating a New Project

1	Start the software, then start a new project from **File→New.** Select **CANopen** as the bus in the next window.	

Adding CANopen Master Devices (CPP110)

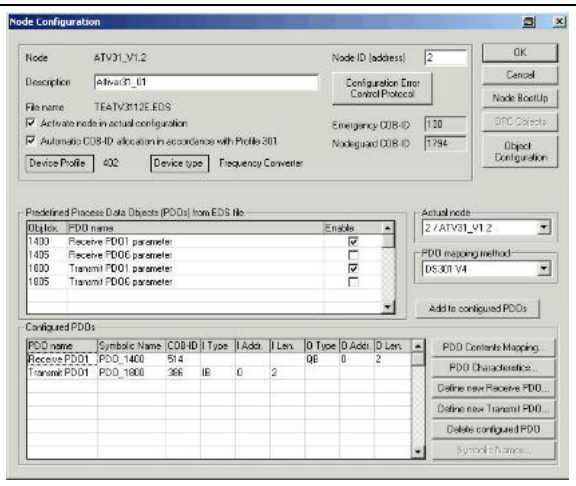
1	Add the PLC's circuit card for the CANopen bus to the project as the master via the **Master** menu item in the **Insert** menu, or by using the equivalent button. Select the **TSX CPP 110** card in the next window. A CANopen address and a name must also be entered.	

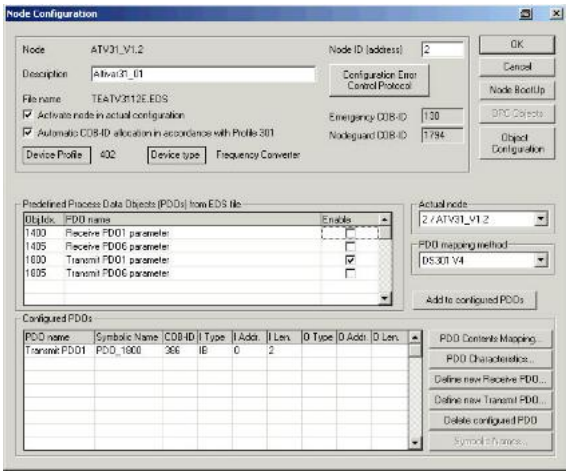
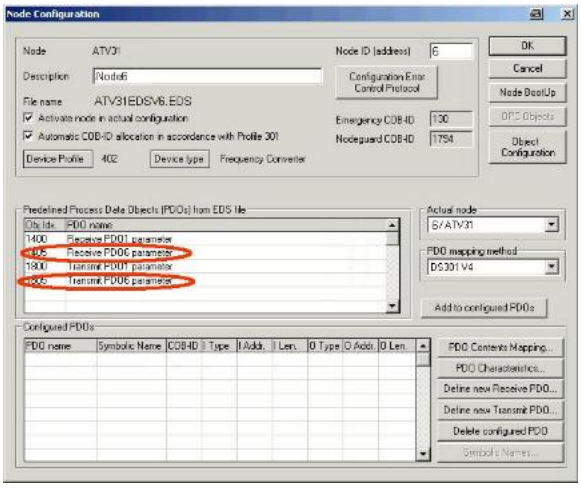
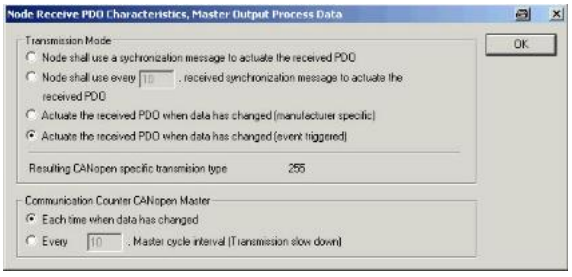
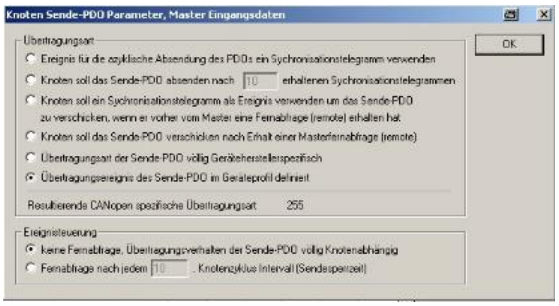
Adding CANopen Node Devices (Altivar 31)

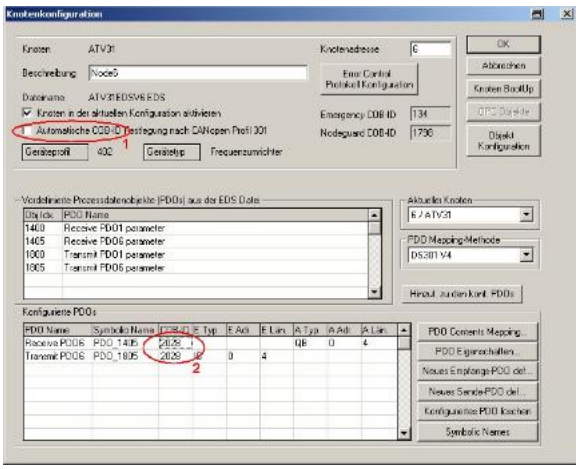
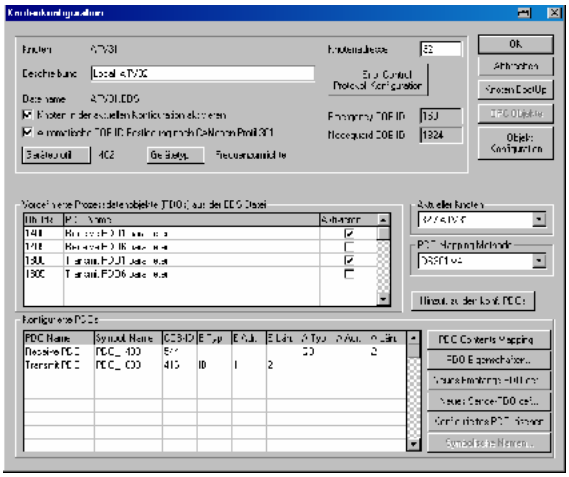
2	Add each drive to the project as a node via the **Node** menu item in the **Insert** menu. In the next window select **Telemecanique** as the **Vendor** and select the type of the corresponding **Available devices**. A CANopen **node ID** and a **description** must also be entered. This process must be repeated for each drive and the other devices. **Note:** You can preselect the manufacturer and profile in the node filter to speed up the search for the devices in the selection list.	
3	Once all devices have been entered there will be two devices altogether in the example project. Select **ID Table** in the **View** menu to call up the identification table, which summarizes all the devices and their addresses as well as the mapped PDO objects.	

Configuring Devices

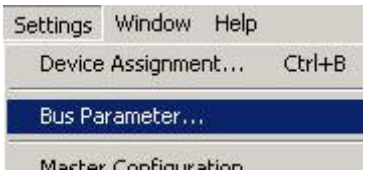
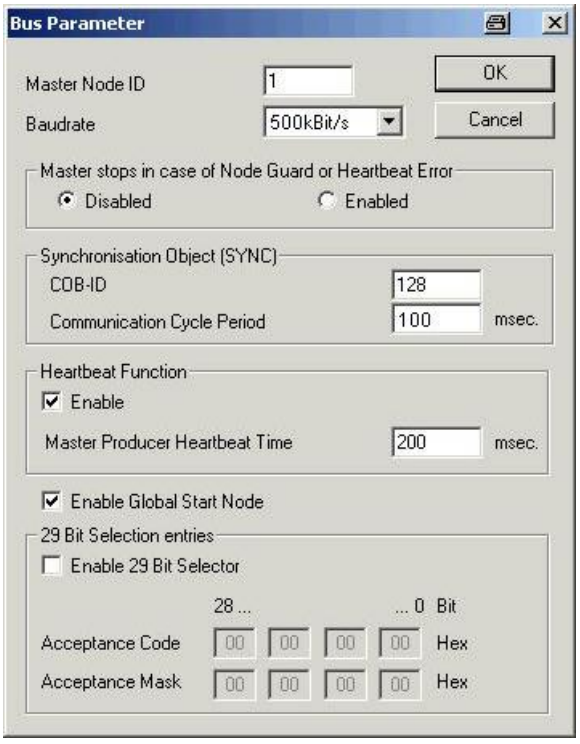
Altivar 31

1	Double-click on the device to open the **Node configuration** window that is used for all bus node settings including configuration of the node at the start of the bus and the transfer of data during operation. The window is divided into three parts: the top part shows the general configuration, the center part shows the predefined PDOs and the bottom part shows the PDOs configured for these nodes and can also be used for configuration or making changes.	

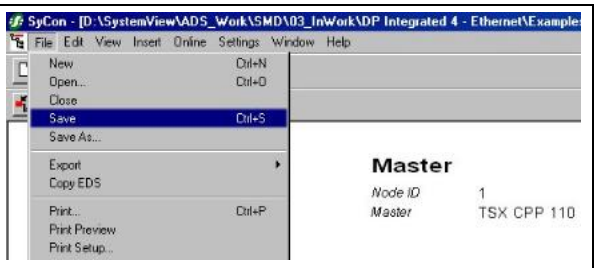
2	Two predefined PDOs are selected for the ATV31 as standard: PDO1 and PDO4. These are not used in the example.	
3	From the predefined PDOs (1, 4), double-click on the **receive and transmit PDOs (PDO6)** to activate them for data transfer between the PLC and ATV31.	
4	The **Receive PDO6** and **Transmit PDO6** PDOs have now been selected for the Altivar 31 drive. After double-clicking on the PDOs to be activated, the window for setting the transmission type appears. For the **receive PDO**, select **Device profile** with the event **When data has changed**. For the transmit PDO, select **Device profile** and **No remote request**.	 
5	As the COB-ID for the PDOs is not assigned automatically at number 5 and higher, a warning will appear.	

6	The COB-ID now has to be entered manually for each PDO. 1. Deselect **Automatic COB-ID allocation**. 2. Modify the COB-ID for the configured PDOs. **Note:** Please note that different Ids must be allocated for each PDO and each ATV31. You can use the values for PDO2, i.e., the values 640 + CANopen address for the transmit PDO and 768 + CANopen address for the receive PDO.	
7	After the transmission mode has been selected the PDO is automatically entered as a configured PDO. There is no need for additional configuration. You must configure a type 6 PDO to send and receive for each variable speed drive. **Note:** Click the **PDO Contents Mapping** button to see the data to be transmitted in the selected PDO. The **PDO Characteristics** button returns you to the transmission mode screen for the PDO.	

Defining CANopen Bus Parameters

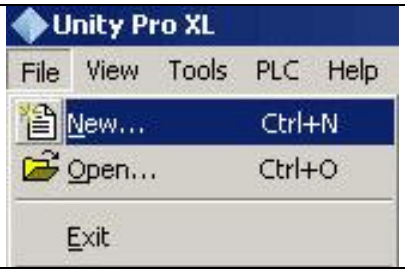
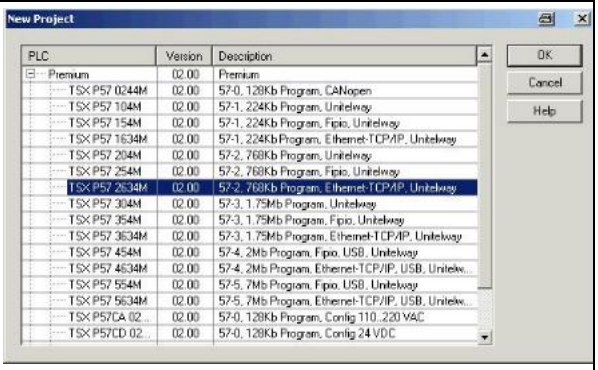
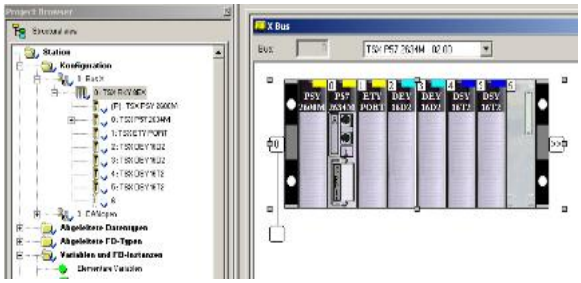
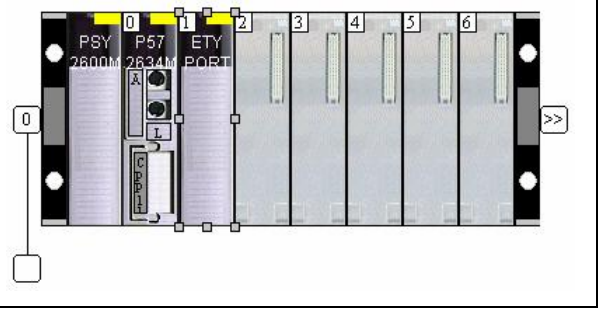
1	The bus parameter window is called up by selecting **Bus Parameter** from the **Settings** menu. The master has to be selected in the bus view.	
2	The transmission rate is the only parameter to be changed, to **500 kBit/s** (kbaud).	

Saving the Project

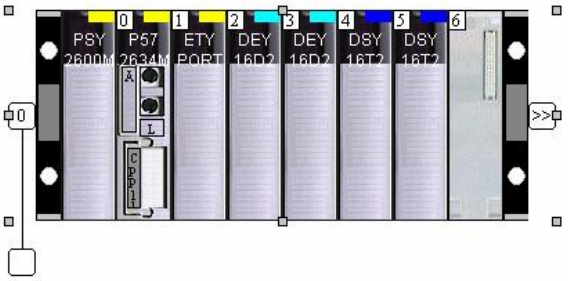
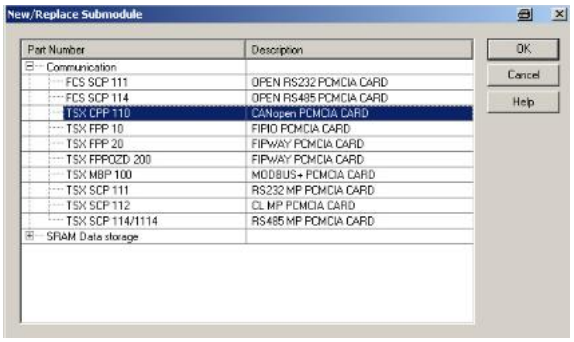
1	Then save the SyCon project (**File->Save**). The project file is saved under C:\Program Files\Schneider Electric\SyCon\Project\DPETH.co. It is used as the basis for future Unity Pro configuration.	

Create a New PLC Project and Select Hardware (Unity Pro)

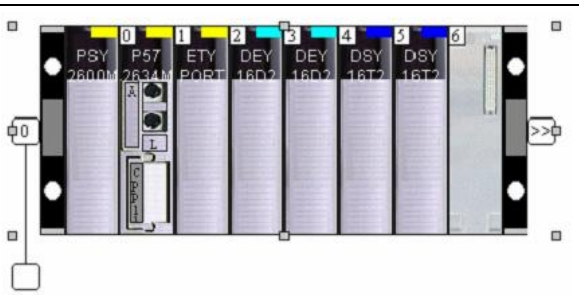
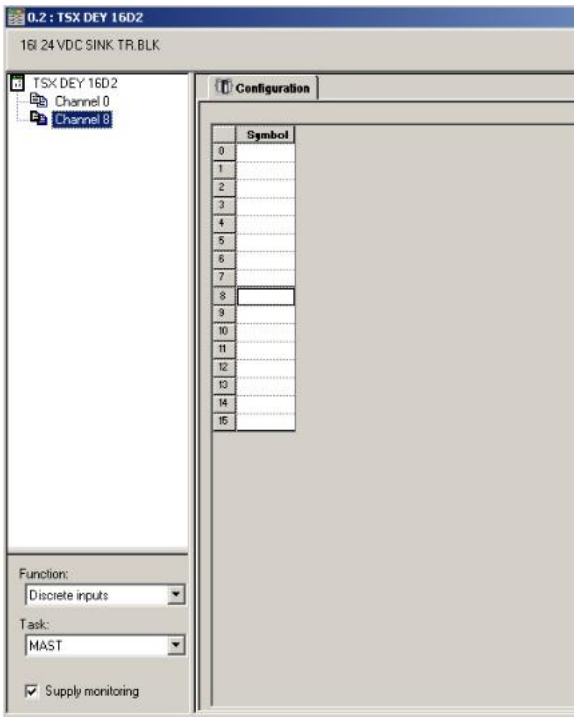
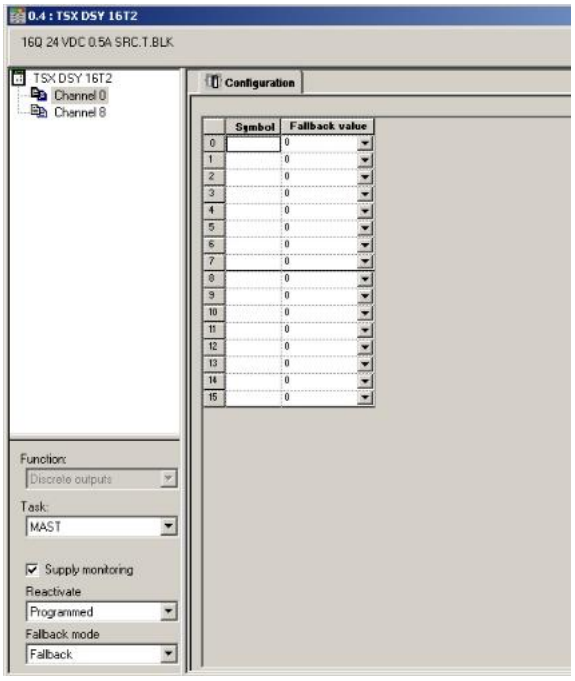
Creating a New Project

1	After starting Unity, the first thing you need to do is create a new project (**File->New**).	
2	When doing so, you must select the correct **PLC**. In our example it is **TSX Premium CPU** **TSXP572634M**	
3	Select **Configuration** in the project browser to open the hardware configuration. Modify the number and size of the racks accordingly Example project: 1 rack with 8 slots **TSX RKY 8EX**	
4	If you are using a double-width power supply, you must "drag&drop" the CPU to position 1 in order for the correct power supply to be inserted (Example: TSX PSY 2600M)	

Creating a New Project Ctd.

5	"Drag&drop" is also used to move the individual modules to the right slots (example project: 32 digital inputs, 32 digital outputs; 2x TSX DEY16D2, 2x TSX DSY 16T2, 1x TSX AEY414, optional 1x TSX ASY410, optional)	
6	Double-click on the CPU's lower PCMCIA slot (B) to open a window listing the permitted PCMCIA cards. The TSX CPP 110 card must be selected for the CANopen bus (under Communication). Repeat the procedure for slot A and enter memory card TSX MRP C001M (or higher if necessary). Now save the project.	

I/O Card Configuration

1	Double-click on the relevant module in the hardware view to open the configuration area for input and output cards. Configure each card individually and confirm your settings on completion.	
2	Digital inputs (TSX DEY 16D2): Eight inputs are grouped in one channel. Each channel (0 and 8) must be assigned to the task to be performed. The inputs of channel 8 can also be disabled (no function).	
3	Digital outputs (TSX DSY 16T2): Eight outputs are grouped in one channel. Each channel (0 and 8) must be assigned to the task to be performed. The behavior of each channel in the event of a fault and on restarting also needs to be defined. In respect of behavior in the event of a fault, a separate value can be defined for each output. The inputs of channel 8 can also be disabled (no function).	

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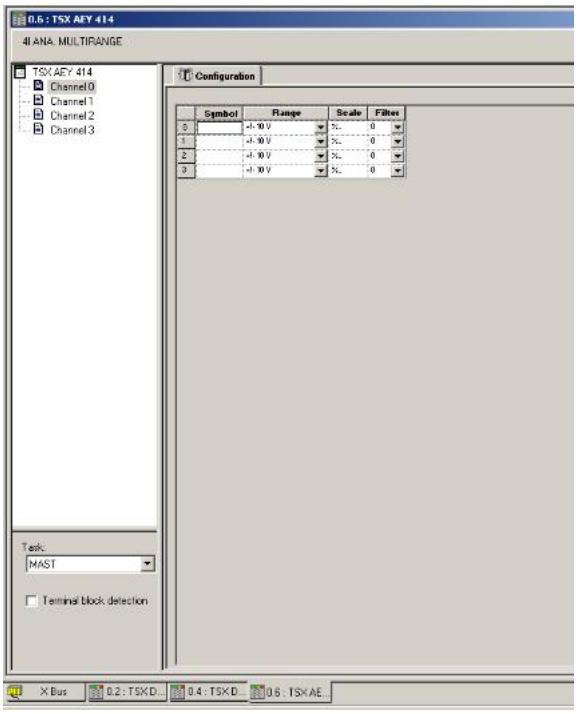
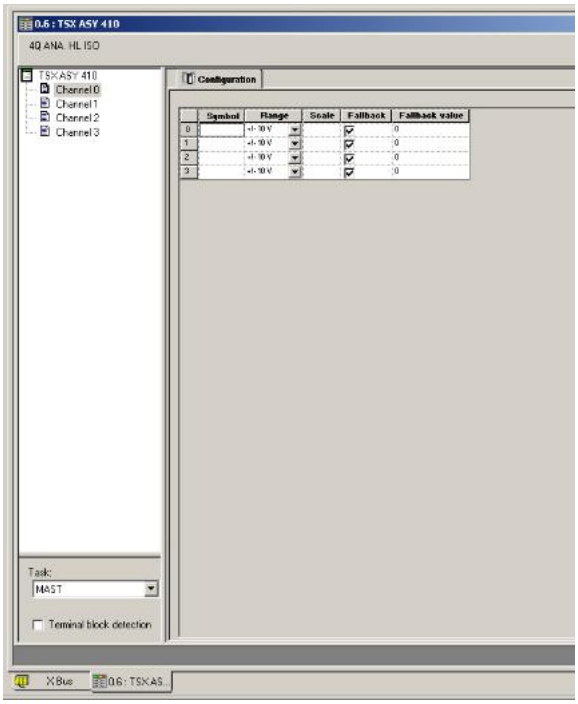
I/O Card Configuration Ctd.

4	Analog inputs (optional) (TSX AEY 414): Each input is considered as an individual channel, which must be assigned to the task to be performed. The type of signal (current, voltage, thermo) and a scale also have to be entered. The inputs can also be smoothed using a filter function.	
5	Analog outputs (optional) (TSX ASY 410): Each output is an individual channel, which must be assigned to the task to be performed. The type of signal (current, voltage) and a scale also have to be entered. In respect of faults, a value to which the relevant output is set can be entered.	
6	The configuration must then be confirmed or validated. You can do this by either closing the configuration window or selecting Validate from the Edit menu. **Note:** You can only save, close and generate the project after you have validated it.	

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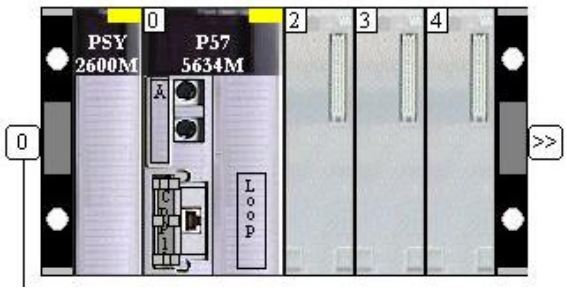
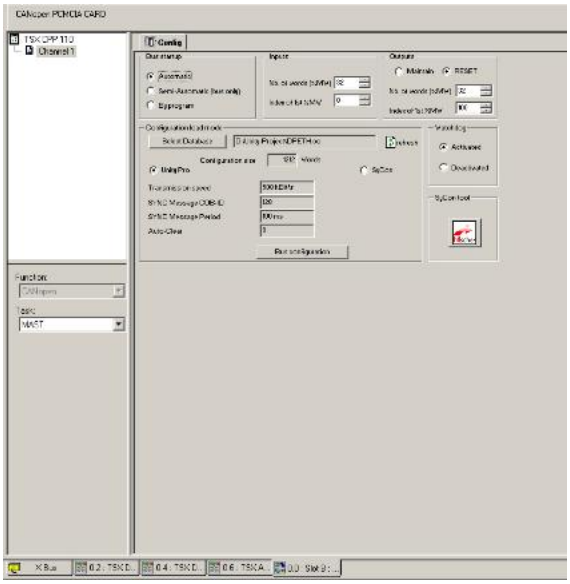
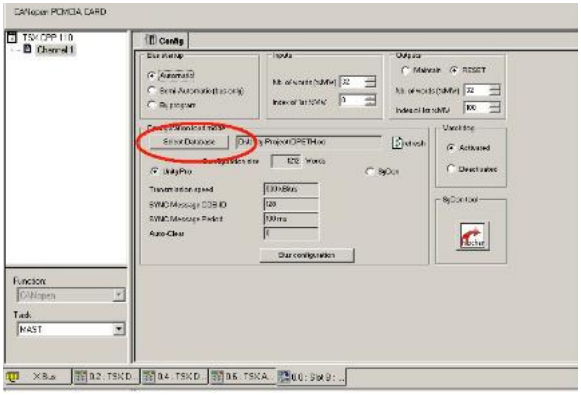
CANopen Communi-cation Ctd.

1	Double-click on slot B again to open the configuration of the CANopen bus.	
2	The configuration window is divided into a number of areas. On the left you can select the association with the task being executed, in this case the master task. The upper part of the window is for selecting the restart characteristics of the bus and the assignment of addresses for the input and output areas. An automatic bus restart is configured in the example project. The **inputs** start at address **%MW0** and the **outputs** at **%MW100**. **32 words** are provided for each area.	
3	The most important configuration task is transferring the file from the SyCon software (*.co). This can be activated by clicking the **Select Database** button. Once the transfer is complete, the most important data appears underneath the file details. You can also choose here whether to use **Unity Pro** or **SyCon** for **bus configuration**. In the example we are using Unity.	

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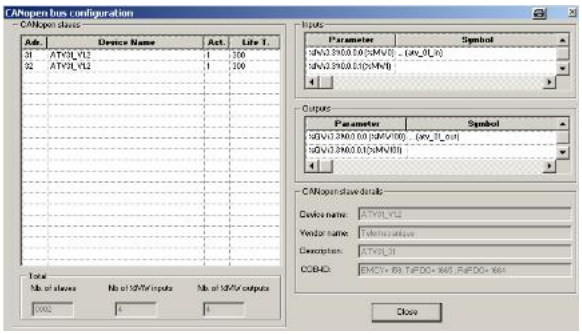
CANopen Communi-cation Ctd.

4	Click the **Bus configuration** button to display the individual bus devices in a new window. Click on one of the devices in the list on the right-hand side of the window to display additional information, such as the I/O addresses. **Note:** The addresses are shown from top to bottom in order of their position on the bus in the SyCon software. The CANopen node addresses are disregarded.	
5	The configuration must then be confirmed or validated. You can do this by either closing the configuration window or selecting **Validate** from the **Edit** menu. **Note:** You can only save, close and generate the project after you have validated it.	

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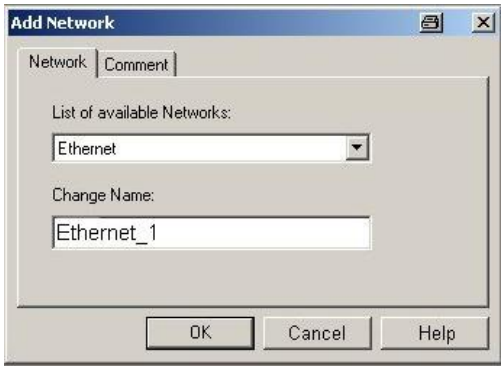
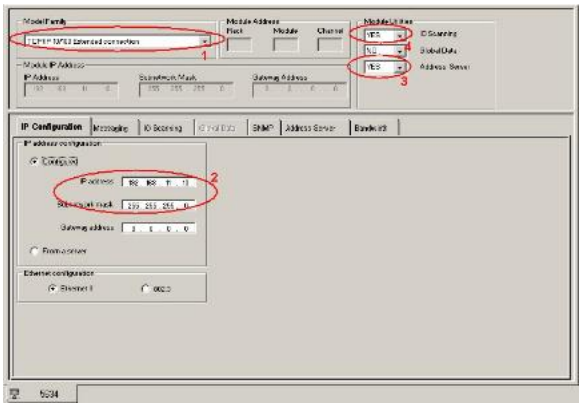
Ethernet Communi-cation

1	Next, select **New Network** under **Communication** → **Network** in the project browser.	
2	In the **Add Network** dialog, specify **Ethernet** as the network type and enter a name (**Ethernet_1**) for the network under **Change Name**. Click OK to create the network.	
3	Open the network and make the following settings in the sequence described: 1. Select the model family: In the case of TSX P57 2634M, you must select **TCP/IP 10/100 Extended connection**. 2. Specify the **IP address** and **subnet mask**. 3. Activate **Address Server** 4. Activate **IO scanning**.	

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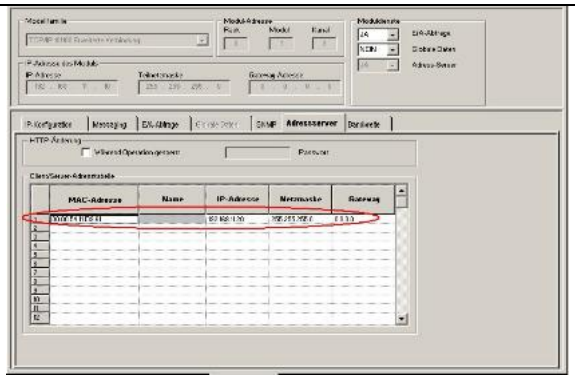
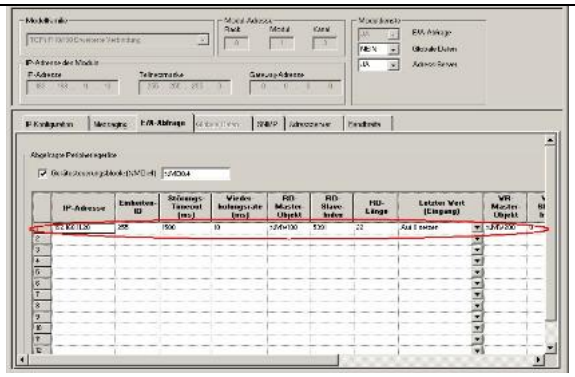
Ethernet Communi-cation Ctd.

4	Next, click on the **Address Server** tab and enter the MAC address of the device (Advantys STB NIP 2212 and ATV71), along with the desired IP address. On the NIP 2212, for example, you will find the **MAC address** printed underneath the Ethernet port.	
5	Next you need to configure device scanning. To do this, click on the **IO Scanning** tab and enter the data relating to the device's **IP address**. **Note:** Details of the example project entries are provided below.	

Health Timeout	1500 ms	Time-out for a fault
Repetitive rate:	10 ms	Data exchange repetition rate
RD Master Object	%MW100	Target for read data
RD Slave Index	e.g., 5391	Start address for reading data from island
RD Length	22	Length of the read area in words
WR Master Object	%MW200	Target for write data
WR Slave Index	0	Start address for writing data to island
WR Length	11	Length of the write area in words

Note: The lengths of the read and write areas are based on the island's I/O data image, which also provides the start addresses.

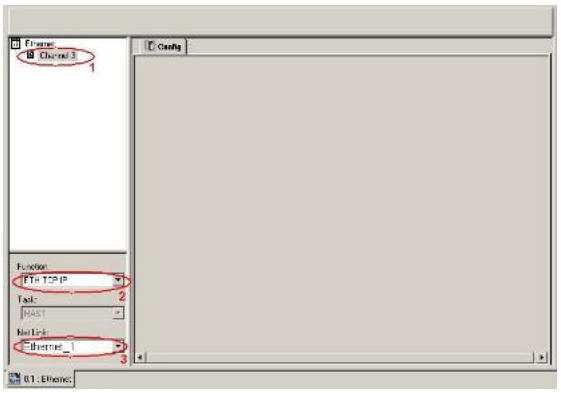
Note: In the case of the Premium PLC, the start addresses from the Advantys island must be reduced by one in Unity (e.g., Unity = %MW1000, ACT = %MW1001).

Note: As well as exchanging the I/O data image, it is also possible to transfer diagnostic data using I/O scanning. For this to happen, the value of "RD Slave Index" must be changed to 5356, in which case the "RD length" will be 57. The diagnostic data will then be located in the first 35 registers in the WR master object. A detailed description of the diagnostic data is available with the Advantys Help function.

6	Now close the configuration and confirm acceptance of the changes when the prompt appears.

Continued on next page

Ethernet Communi-cation Ctd.

7	The final step consists of assigning the configured network to the hardware. To do this, switch to the **hardware view** and open the network connection by double-clicking on the **CPU network connection**. Proceed as follows: 1. Select the channel (in this case: channel 3). 2. Select the function (in this case: ETH TCP IP). 3. Select the network connection (the configured connection)	

I/O Data Address Overview

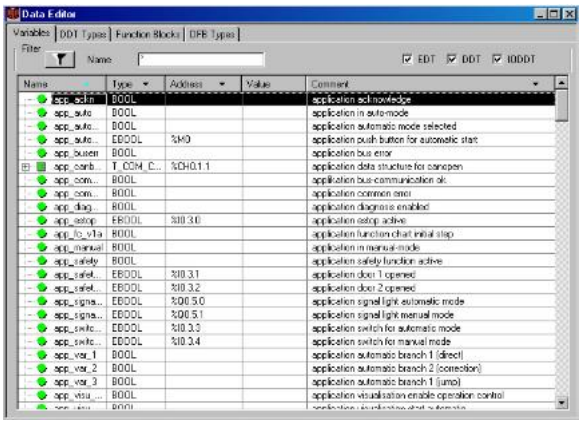
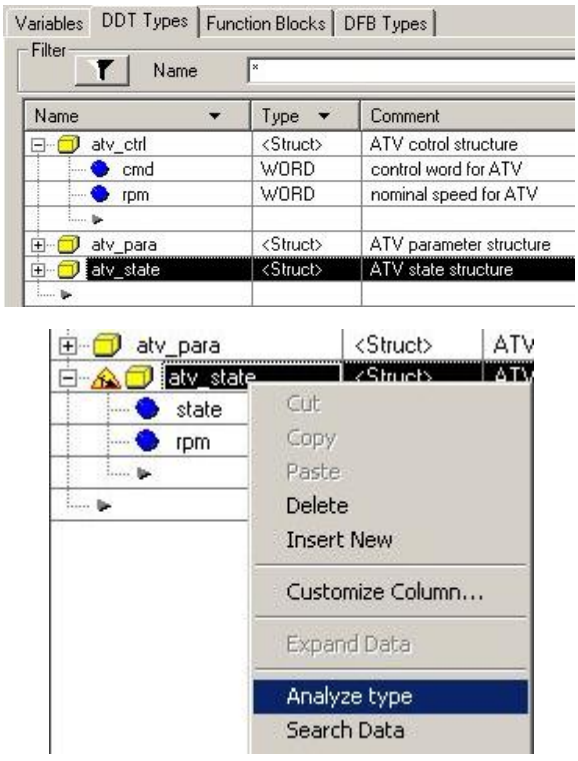
1	The tables provide an overview of the I/O data for the example application. Both the PLC addresses and the I/O platform (Advantys STB) addresses are given. In the case of the I/O platform, the addresses available externally are given. By contrast, the internal CANopen extension addresses are not given. **Note:** On the PLC side, two data structures are defined for communication with the ATV31, each of which contains two integer values. The first of these values is the control word used to convey the motion commands and the second is used to specify the speed.	PLC / Advantys %MW100 → 45392 Data DDI3610 %MW102 → 45394 Data DRC3320 %MW103 → 45395 Data 1. ATV31 %MW105 → 45397 Data 2. ATV31 %MW107 → 45399 Data 3. ATV31 %MW109 → 45401 Data 4. ATV31 %MW111 → 45403 Data FTB12E04S %MW117 → 45409 Data FTB08E08S %MW122 SPS / Advantys %MW200 → 40001 Daten DRC3320 %MW201 → 40002 Daten 1. ATV31 %MW203 → 40004 Daten 2. ATV31 %MW205 → 40006 Daten 3. ATV31 %MW207 → 40008 Daten 4. ATV31 %MW209 → 40010 Daten FTB12E04S %MW210 → 40011 Daten FTB08E08S %MW211

Creating the Application Program

The application program logically simulates the machine and its function. This document and the example application are only able to outline the basic framework for a program of this type. The key steps required to create the application program are set out below:

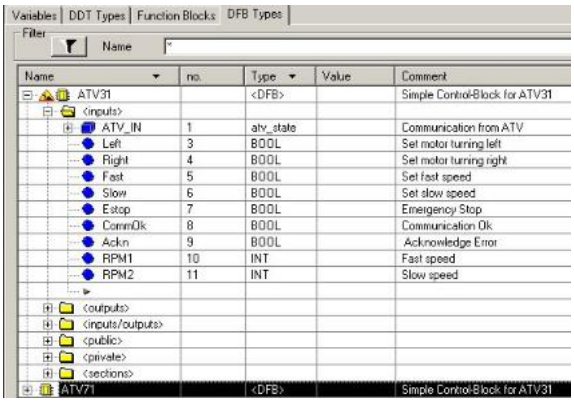
1. Creation of variables and I/O assignment
2. Creation of the state machines for the speed drives
3. Application program and logic creation (motor control, mode control, interfaces for visualization)

Creating Variables

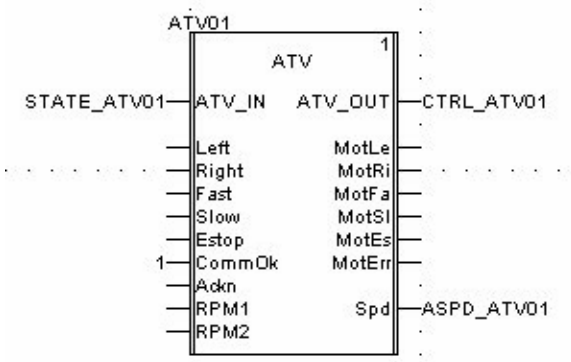
1	Variables are declared and assigned to inputs and outputs in the **Data Editor**. The following information is required for a variable: • Name • Type • Address (if applicable) • Init value (if applicable) • Comment Variables are created when they are entered in the **Data Editor** table.	
2	In the example program, as well as elementary variables for digital and analog data, structures are used for data exchange with the variable speed drives. These can be created on the **DDT Types** tab in the **Data Editor**. As well as a name and comment, you need to declare the individual elements of the structure. Right-click with the mouse and select **Analyze type** to complete the definition of the structure. Once defined, the types can then be used for variable declarations.	

Creating State Machines for Speed Drives

DriveCom

1	The variable speed drives are controlled via a state machine (DriveCom). For this purpose, a separate “derived function block” (DFB) is written for each in the example program. The definition of a DFB also starts in the **Data Editor** (**DFB** tab), where the **inputs and outputs**, as well as the **internal variables** of the DFB, have to be defined. The **program sections** of the DFB can also be created here.	

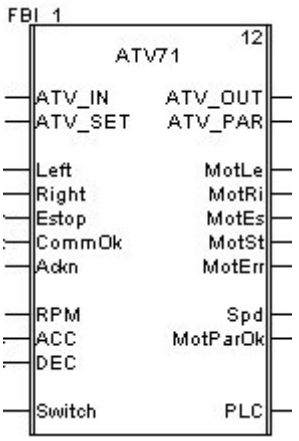
2	The DFB is programmed in structured text in two sections in the example program. One section prcesses the input data (Status) and the other the output data (Ctrl).
	
	Programming is done using the Editor, where the code can be entered/altered. Auxiliary functions for invoking other function blocks are also available.
		``(* ATV Acknowledge Error *)
		FBI_0 (CLK := Ackn);
		IF (ATV_Error AND FBI_0.Q) THEN
		ATV_OUT.CMD := 16#0080;
		END_IF;
		
		(* ATV Set to Wait-Mode *)
		IF ATV_Locked THEN
		ATV_OUT.CMD := 16#0006;
		END_IF;
		
		(* ATV Set to Ready-Mode *)
		IF ATV_Wait THEN
		ATV_OUT.CMD := 16#0007;
		END_IF;
		
		(* ATV Start Operation *)
		IF (ATV_Ready AND Right) THEN
		ATV_OUT.CMD := 16#000F;
		ELSIF (ATV_Ready AND Left) THEN
		ATV_OUT.CMD := 16#080F;
		END_IF;```

3	The blocks are selected in the section in which **instantiation** is to take place (the simplest way to choose a function block is to use the **Ctrl+D** or **Ctrl+I** shortcut and then enter the **block name**. The function block can then be positioned in the section. For the ATV31, the function block manages the emergency stop, two directions of rotation, two velocities and the fault acknowledgement.	

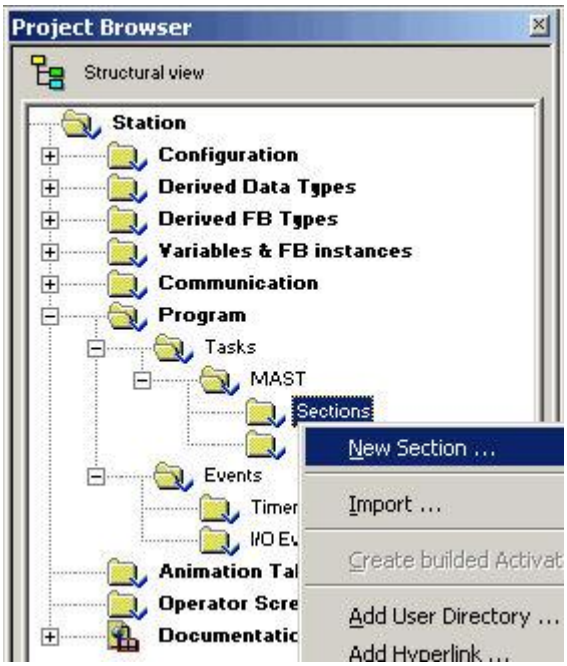
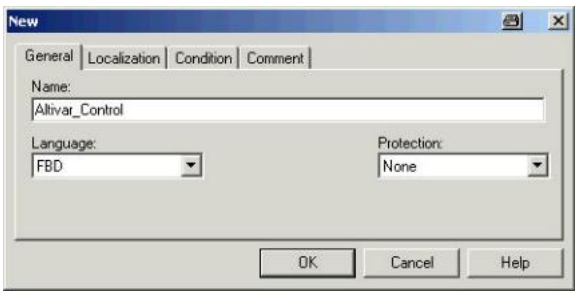
Continued on next page

Creating State Machines for Speed Drives

DriveCom Ctd.

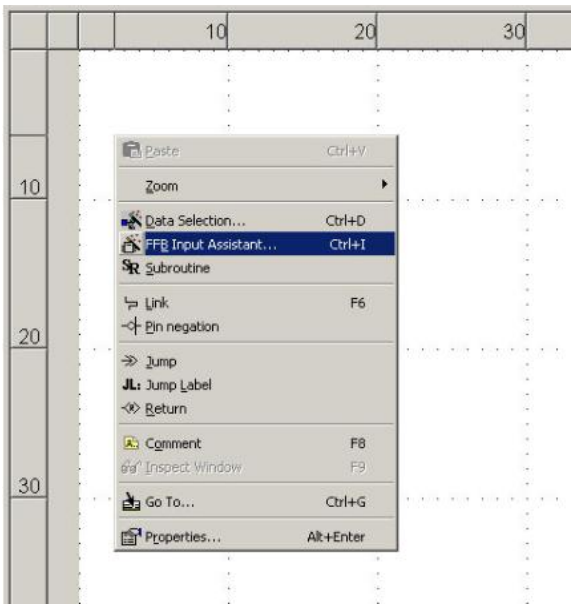
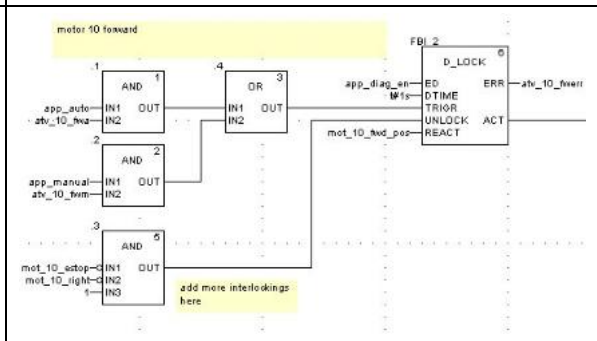
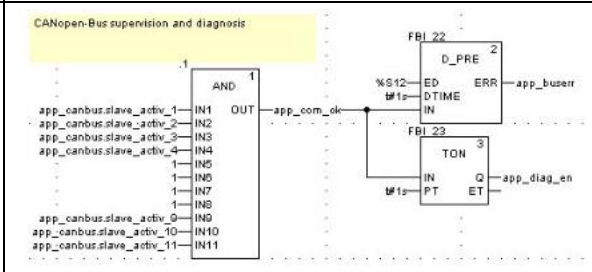
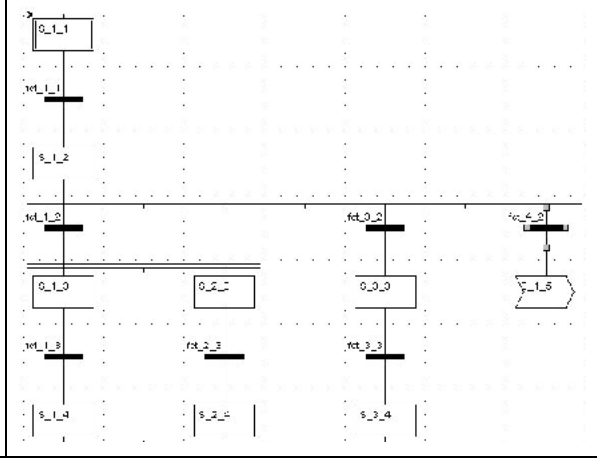
4	For the ATV71, the function block manages the direction of rotation, the emergency stop and fault acknowledgement. The velocity can be freely defined. Furthermore, the ramps can be modified in the speed drive (for this purpose, a secondary structure is provided in the block for the associated parameters).	

Creating the Logic

1	In the example program, the application logic has been programmed as a function block diagram (FBD). Completed units form a → **Section**. This must be created first. You do this in the **Project Browser**, under → **Program**, in the associated task (right-click with the mouse to open the relevant menu).	
2	Once you have created a new section you will need to enter a name and language for it. In the example programs, with the exception of automatic control, all sections are programmed in FBD.	

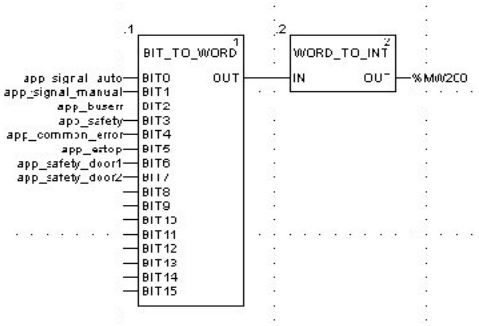
Continued on next page

Creating the Logic Ctd.

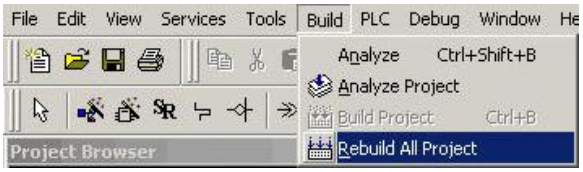
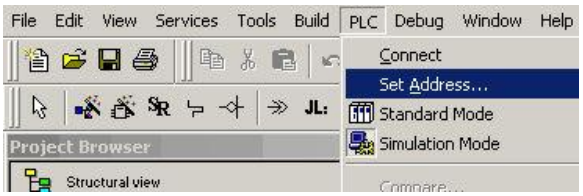
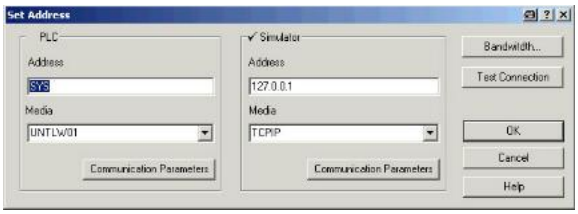
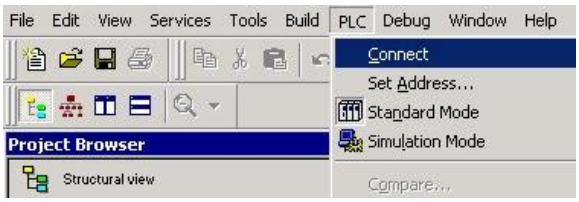
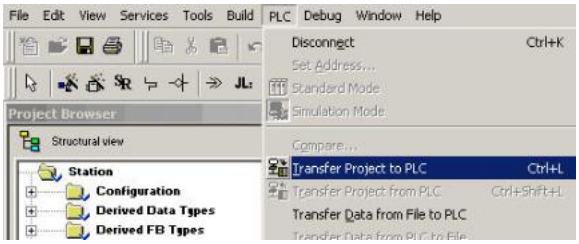
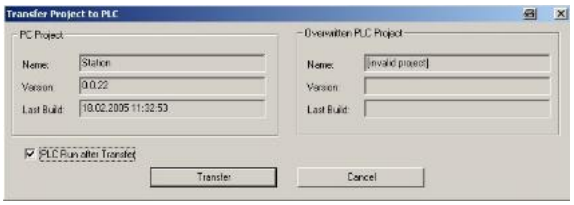
3	The blocks (**Ctrl+D**) or popup menu (**Data Selection**) can then be called up in the section. Other elements such as links, negations or comments can also be accessed in this menu or via shortcuts.	
4	A separate section in which directions can be controlled and parameters defined has been provided in the program for each individual drive. Directions of rotation are controlled separately for each operating mode.	
5	In the "application" section, the operating modes are defined and general monitoring of the safety functions or CANopen bus takes place.	
6	A sequencer has been provided for automatic mode to control the machine sequence. Actions and step enables in the next step must be defined for each individual step.	

Continued on next page

Creating the Logic Ctd.

7	Data is transferred between the PLC and Viewer in the "visu" section. It is here that the necessary data is written to/read from flag words. The principle that logic functions can only be executed in the PLC applies.	

Program Download

1	Upon completion of programming, the **entire project** must be **rebuilt**. To do this, select the relevant menu item or button. **Build→Rebuild All Project**	
2	You must define the PLC address before establishing a connection to the PLC (**PLC→ Set Address**). In this case, the Unitelway protocol (**UNTLW01**) must be selected and the PLC **SYS** (standard system address) entered as the address.	 
3	The connection is established by selecting **Connect** from the **PLC** menu or pressing the equivalent button. For it to work, the appropriate programming cable must be connected to the PLC.	
4	The program can now **transfer data to the PLC** and the PLC can be started up. **Note:** If you want the PLC to **start** as soon as the download is complete, you must check the relevant box before starting the transfer.	 

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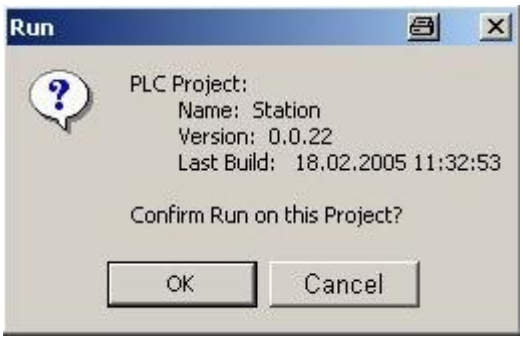
Program Download Ctd.

5	Confirm that you want to start the project.	

Devices

Introduction

This chapter describes the steps required to initialise and configure the devices to attain the described system function.

I/O Platform - Advantys STB

General

This chapter describes how the Advantys I/O platform is configured using the Advantys configuration software.

Proceed as follows:

- **Make the hardware settings, in particular the IP address**
- **Create a new project (workspace)**
- **Configure the hardware (network interface, power supply and I/O modules)**
- **Configure CANopen extension communication (baud rate)**
- **If necessary, adjust device parameters (reset inputs, settings, etc.)**
- **Download configuration to island.**

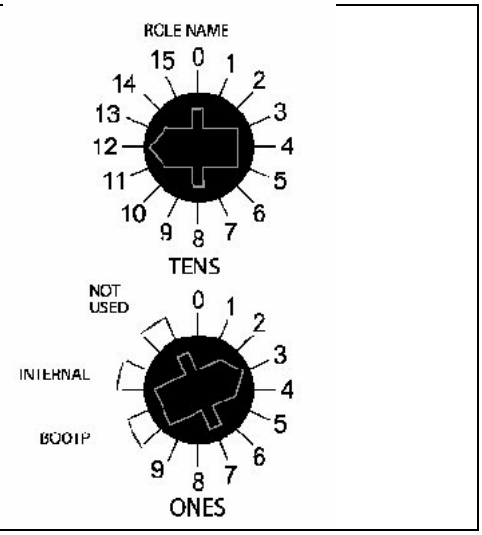
IP Address Assignment

The type of IP address assignment is set via the rotary switches on the STB NIP 2212 island head. Each of the rotary switch positions that can be used to specify a valid IP address is indicated on the housing of the STB NIP 2212. There are a total of four different methods for assigning addresses:

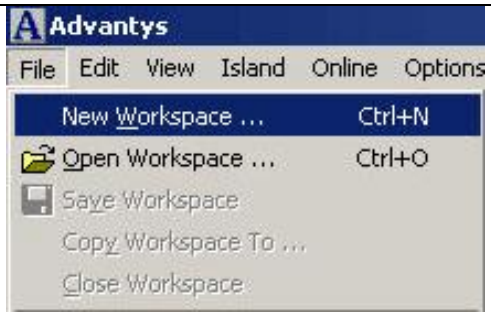
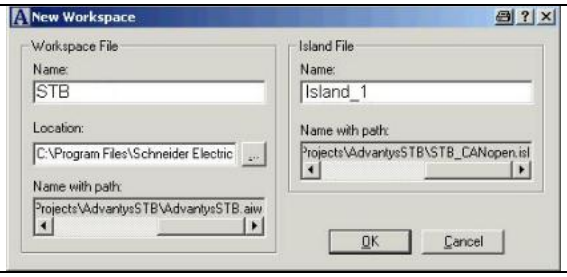
- Assignment of the address via BOOTP
- Assignment via DHCP
- Assignment of a fixed IP address via the STB NIP 2212 web page
- Conversion of MAC address into an IP address

The BOOTP mechanism is described below. Details of the other methods can be found in the product documentation or in the Advantys configuration software Help function.

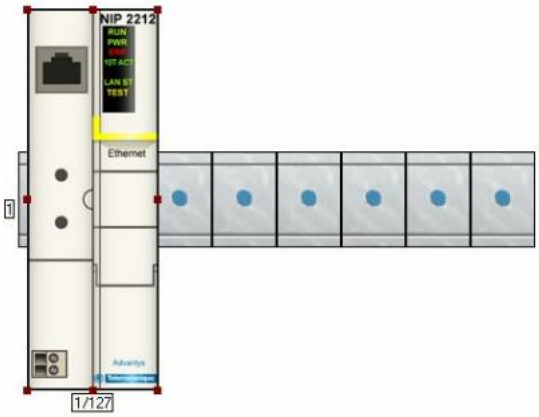
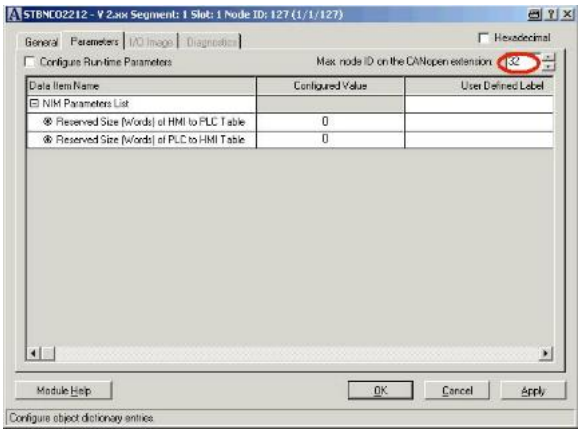
BOOTP Mechanism

1	Within the context of the example project, the address is assigned using the BOOTP mechanism, as the PLC's Ethernet interface has a BOOTP server, making this the simplest method.	
2	To use the BOOTP method, you must set the top rotary switch to the 0 position and the bottom one to "BOOTP".	

Creating a New Project

1	After starting the Advantys software, you must create a **New Workspace**…	
2	To do this, you must specify the path, the workspace **name** and the **name of the first island**.	

Hardware Configuration

1	Select Ethernet network interface module STB NIP 2212 as the island head.	
2	Switch to the Parameters view by double-clicking on the head and adjust the maximum node ID on the CANopen extension as necessary. **Note:** This does not need to be done in the example project. Instead we will use the default setting (32). 5 words are reserved for each direction (HMI → PLC and PLC → HMI) in each station to which a Magelis HMI XBT-N is connected.	

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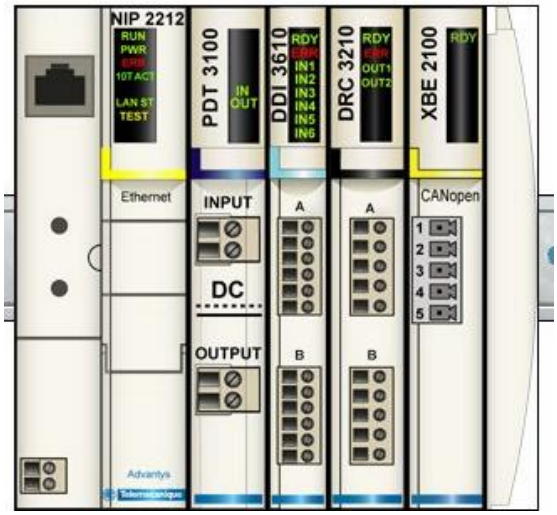
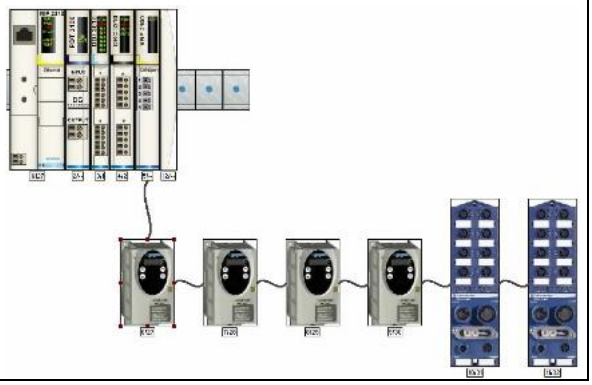
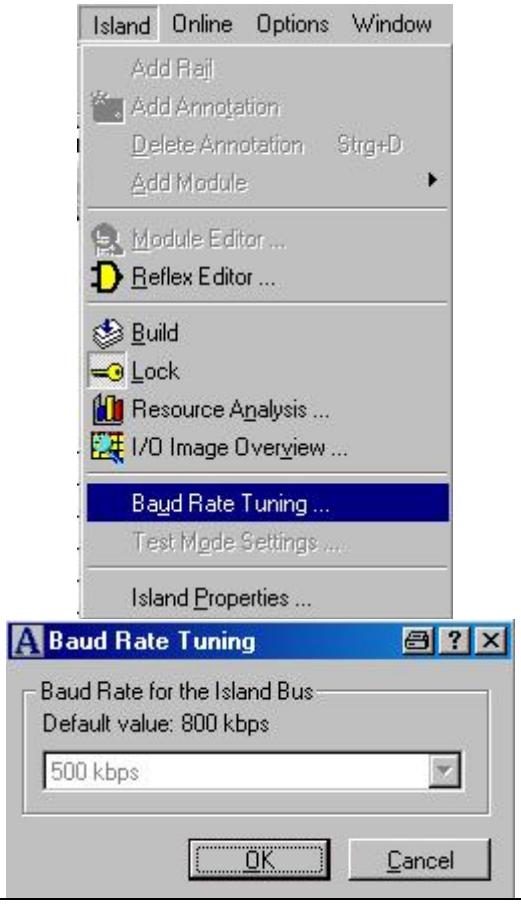
Hardware Configuration Ctd.

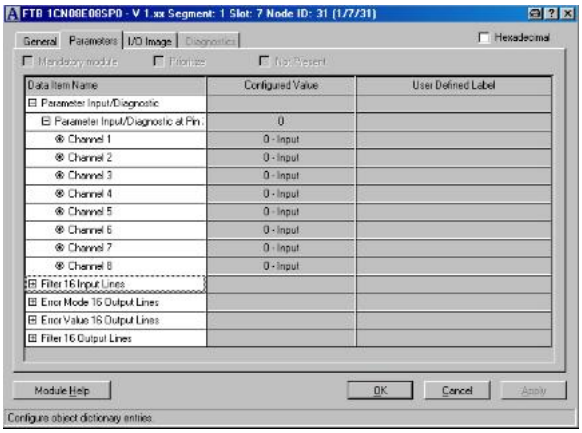
3	Next, add the remaining stations: STB PDT 3100, STB DDI3610, STB DRC 3210, STB XPE 2100 and do not forget about bus connection STB XMP 1100.	
4	Finally, the CANopen extension can be configured by writing the devices (ATV31 and FTB) to the STB XPE 2100 module. Addresses are assigned in accordance with the order on the bus. **Note:** This may mean switching the devices around so that the addresses match the order set in the hardware configuration.	

CANopen Setting

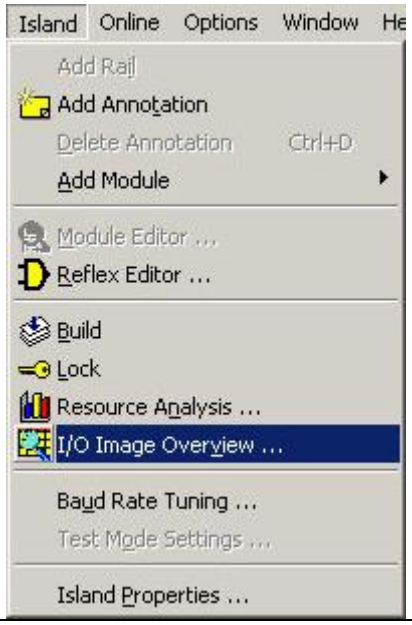
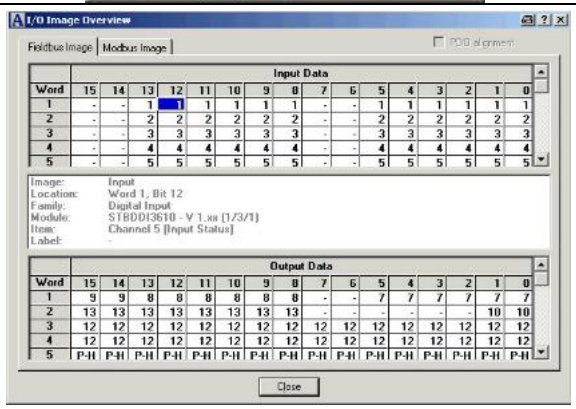
1	The transfer rate for the CANopen extension must be set to **500 kbps** via the **Baud Rate Tuning** menu. This transfer rate matches that set for the ATV31 and FTB modules.	

Adjusting the Device Parameters

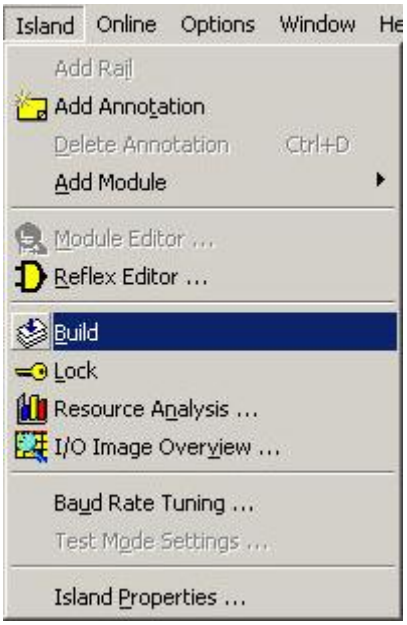
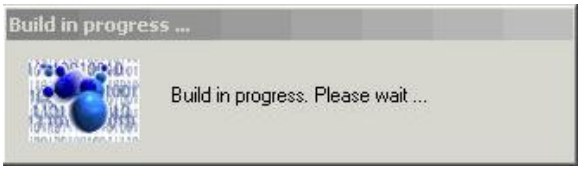
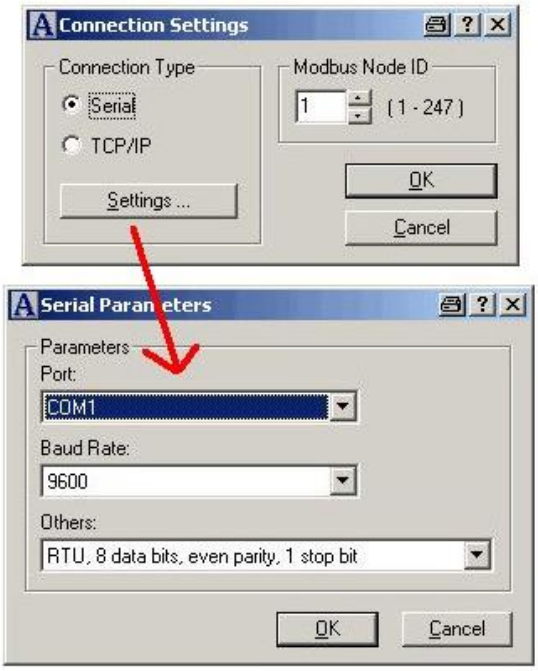
Parameters can be set for the individual devices on the Advantys island. On the CANopen extension, parameters can only be set for the Advantys FTB, not for the ATV31. The parameters are then transferred to the devices whenever the island is restarted.

1	Double-click on the device (FTB in this case) to open the Parameters window.	
2	The figure shows the settings for the use of pin 2 of an Advantys FTB by way of example. New values can be specified by entering them in the “User defined label” field. **Note:** In the case of the example project, no values need to be changed here.	

I/O Data Image

1	You can use **I/O Image Overview…** in the **Island** menu or the equivalent icon to call the function for assigning the I/O to the memory areas.	
2	The information concerning the selected data is displayed in the description field.	
3	Alternatively, the project can also be printed out. The printout will contain the same information. **Note:** The “PLC” chapter contains a list of address assignments.	

Configuration Download

1	Start by selecting the **Build** option in the **Island** menu or the equivalent icon to generate a machine-readable version from the completed configuration.	
2	An information window will be displayed while the build is in progress. Once the build process is complete, a message will be displayed informing you of whether or not the operation was successful.	
3	If this is the first time that a connection to the island has been established, the connection settings must first be specified by selecting **Connection Settings** from the **Online** menu. If you have chosen a **serial connection**, the settings must be made as shown here.	

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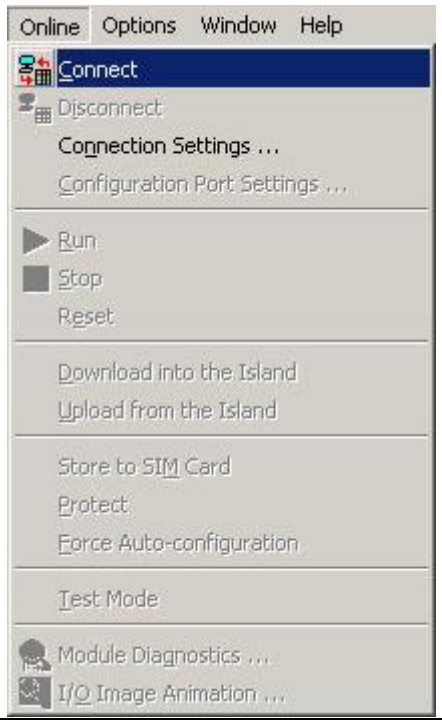
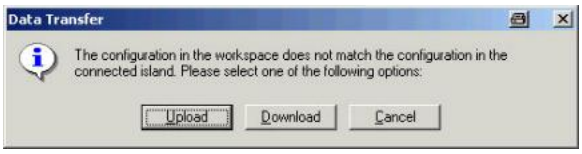
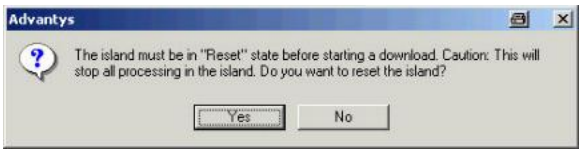
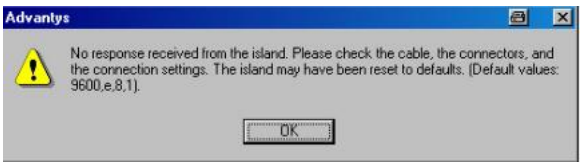
Configuration Download Ctd.

4	You can now establish a connection to the island by selecting **Connect** from the **Online** menu or by pressing the equivalent button. **Note:** If no build operation has yet been performed, the software will now initiate an automatic build.	
5	Once the connection has been established, the Advantys software will detect that the machine-readable version generated does not match the current configuration in the island and will present you with an option to Download or Upload. After selecting **Download**, confirm the security prompt.	 
6	A progress bar will be displayed during download. Once the download is complete, the island will perform a reset and the connection will be interrupted. Once you have confirmed the prompt, re-establish the connection with the island.	 

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Configuration Download Ctd.

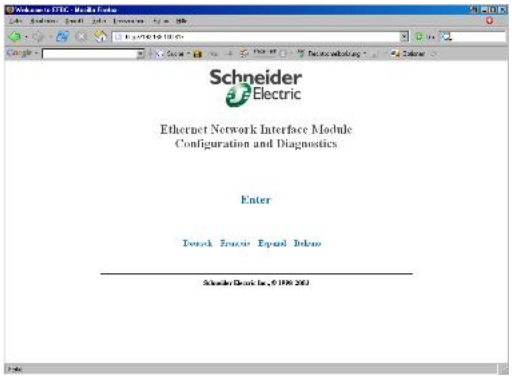
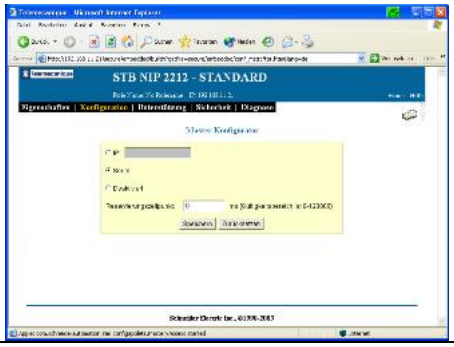
7	Once the connection has been reestablished, you can start the island by selecting **Run** from the **Online** menu or pressing the equivalent button.	
8	Confirm the prompt. Following successful startup, the following message will appear in the output window: “No errors. Island fully operational.”	

Parameterizing Advantys STB Online

Introduction

This section describes how to parameterize the Advantys STB online (via a WebServer).

Parameterize Advantys STB Online

1	When the application program is running in the PLC, the BOOTP server is also active. Following an Advantys STB power cycle, the IP address is transferred and the island can be reached using this address (e.g., http//192.168.100.61) and a Web browser (e.g. Internet Explorer). The **default login** is **USER** and the **password** is also **USER**. The password can be changed in the Security area.	
2	The master configurator and the master controller can both be accessed in the Configuration area.	
3	The following settings should be made in order to use an HMI on the CFG port: <u>Master Controller</u> Reservation Time: 0	
4	<u>Master Configurator</u> Master: Serial Reservation Time: 0 All of the settings should be saved.	

HMI Functional Expansion on Advantys STB

Visual Display

Advantys STB supports the local connection of a visual display unit, e.g., a Magelis XBT-N 401. In this case, the VDU data must also be transferred between Advantys STB and the PLC so that the drives can be operated via the local visual display unit with the aid of the PLC.

Local Control

Local control/operation of drives is **not** possible without a higher level control system. This is mainly attributable to the state machine required for control of the variable speed drive, which is only available on the PLC and cannot be implemented locally. The operating states of the drives can be displayed, however.

Local control/operation of motors (TeSysU) without a higher level control system **is** possible, and is described in this example.

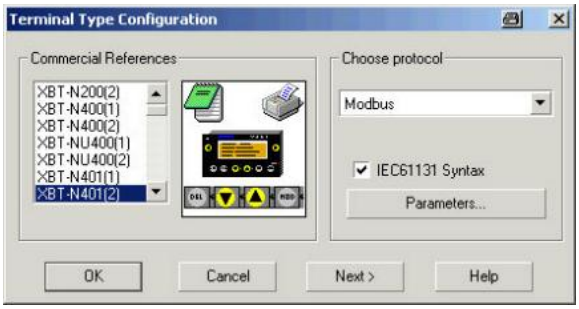
Introduction

This section describes how to set up the Magelis HMI's visual display. The HMI application for the XBT N401 is created using the XBT-L1000 HMI software.

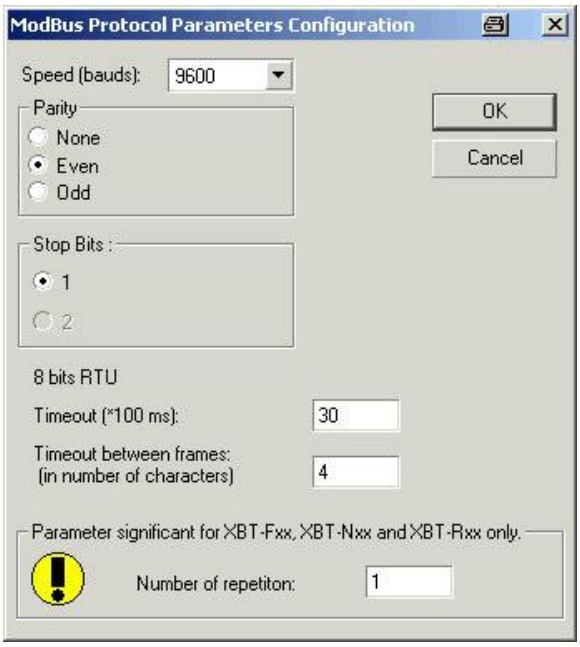
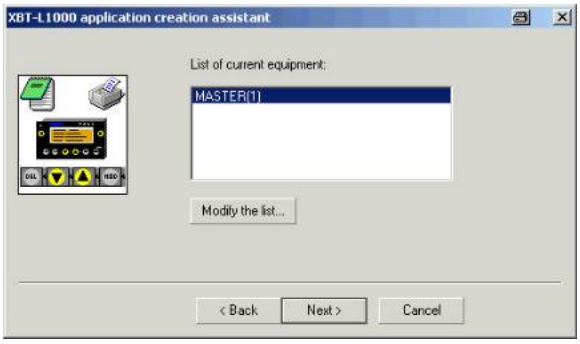
Proceed as follows to integrate the HMI:

- Create a new project
- Configure the HMI
- Create an application page
- Simulate the application
- Transfer to the operator terminal

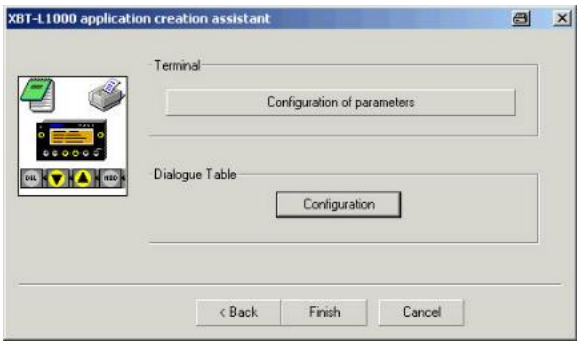
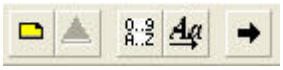
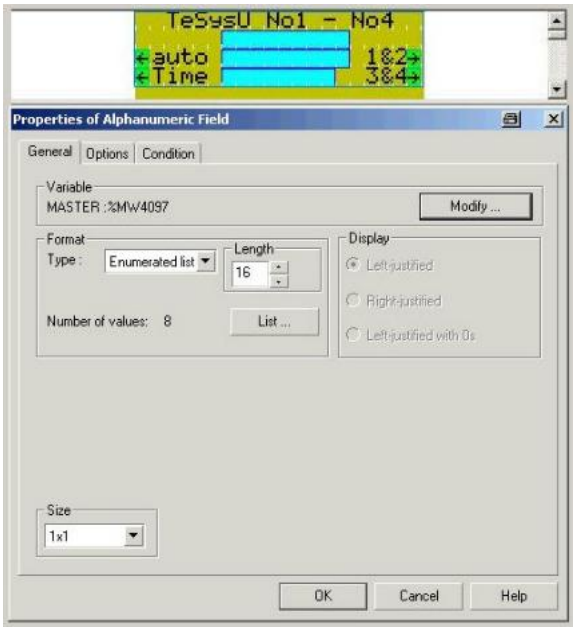
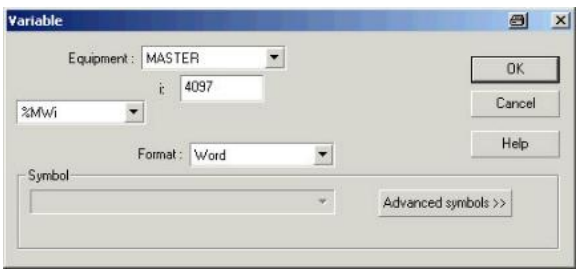
HMI on the Advantys STB

1	**Configure the HMI** The **Terminal Type Configuration** window opens. Select: • Type: **XBT N401** • Protocol: **Modbus** In the same dialog, select the Modbus communication **protocol parameters**.	

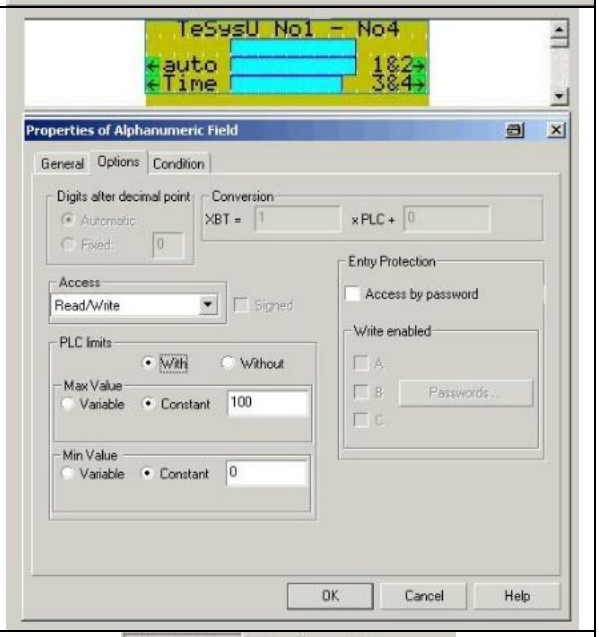
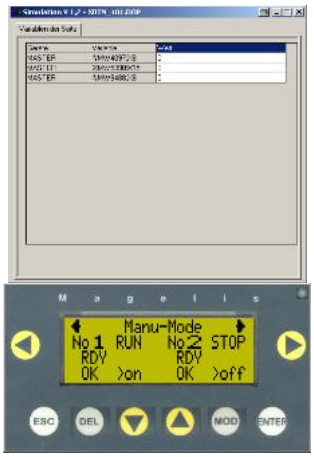
HMI on the Advantys STB
Ctd.

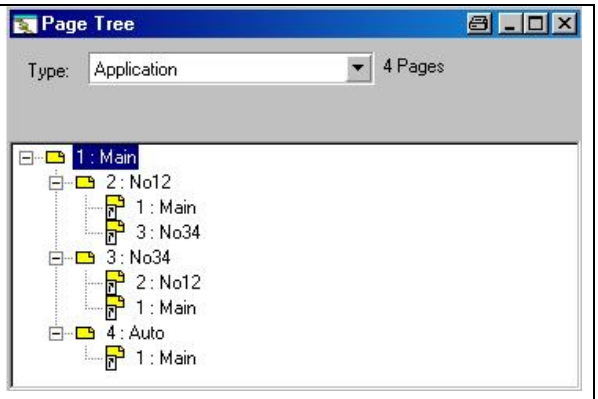
2	**Set Modbus protocol parameters** The same parameters as those on the Advantys STB CFG port should be set. These are: • Speed: **9600 Bd** • Parity: **Even** Click OK to close this window and continue with the parameterization by clicking Next.	
3	Assign project name and click Next.	
4	Enter the symbolic name and the network address for the connected devices in this window. The network address must match that of the Advantys STB CFG port.	
5	Continue by setting the language.	

HMI on the Advantys STB
Ctd.

6	Do not make settings for the terminal and dialog table.	
7	After completing the basic parameters, create the application pages. **Text objects** and **links** to other pages can be created on an application page.	
8	Properties can be assigned to the alphanumeric fields. First, specify the variable, which is to activate the field.	
9	Select the source/target from the **Equipment** drop-down list. Enter Advantys here. On the first screen, bit 8 of word %MW9488 is used. On the second screen, the whole word %MW4097 is used.	 

HMI on the Advantys STB
Ctd.

10	Different formats are available for the display. The first or second text is displayed here, depending on the bit state. As well as the text, which has been converted from a value, the value itself can also be displayed.	
11	The tab also indicates whether the variable is read-only, write-only or read/write.	
12	The application can be simulated “offline” (without HMI connected) using the simulation function of the XBT-L1000 software.	 
13	In order to download the application from the PC to the Magelis XBT-N401 HMI (**Transfers → Export**), the XBT-Z915 communication cable will need to be connected. Start the download by selecting **Export** in the **Transfers** menu.	

14	The **Page Tree** window contains information about the display pages and their connections.	
15	From the individual pages, other pages that have to be configured accordingly can be called.	
16	The configured pages are shown below. AUTO or MANU mode can be selected on the start page. From here, you can switch to the other screens.	
17	The three state indications for the first two TeSysU motor controls are shown in the **Manu Mode** window. The drive can also be switched on and off.	
18	As in step 17 above in drive numbers 3 and 4 only.	

HMI on the Advantys STB Ctd.

19	All of the drive stati are shown on this page.	

Advantys STB & CANopen Extender Operating Behaviour

Introduction

The address and transfer rate must be specified for all the devices on the CANopen extension.

Note: It is important to ensure that the addresses run consecutively in descending order, starting with 32, which is the maximum start address. The start address can be anywhere within the range of 8-32 using the Advantys software (see I/O platform chapter). This should be taken into account when assigning addresses.

CANopen Extension Nodes

The maximum number of nodes on the extension is 12. The configuration described above is capable of handling six devices without any discernible problems. Similarly, there is no evidence to suggest that the order/address of the individual stations will be adversely affected.

Starting Characteristics

As soon as the power is switched on, the drive island devices enter the initialization phase, during which their own parameters are (re)set.

The Advantys STB initialization process takes the most time. During this time, the CANopen extension starts up and parameters are transferred from the Advantys STB to the extension devices (if such parameters have been defined in the Advantys configuration software).

For the purpose of operating the drive island, the island (i.e., Advantys STB) and the PLC must be able to communicate with one another. Without this active communication, it will not be possible for the DriveCom profile of the variable speed drives to be evaluated and controlled and they will switch to fault mode.

CANopen Extension configuration Errors

Below is a description of how the bus behaves in the event of an incorrect configuration, particularly addressing errors:

- In the event of a duplicate bus address being assigned, the two devices with the duplicate address are excluded from bus operation and no data can be exchanged with them. Data exchange with all the other devices continues as normal and is unaffected by this fault.
- If a device on the bus has the same address as the XBE 2100 extension module, the bus will fail to start and no data will be exchanged.
- In both cases, the relevant diagnostic message will be displayed in the Advantys software or on the island head Web page to enable the error to be determined on startup.

I/O Platform - Advantys FTB

Introduction

This section describes how to create the remote FTB I/O platform as a CANopen extension on the STB island.

Proceed as follows to integrate the FTB:

- **Assign the CANopen address and transfer rate for Advantys FTB**
- **Configure the STB CANopen extension**
- **CANopen settings**
- **Adjust device parameters**
- **I/O data image**
- **Build**
- **Connection settings**
- **Data transfer**
- **Application download**
- **Start application - RUN**

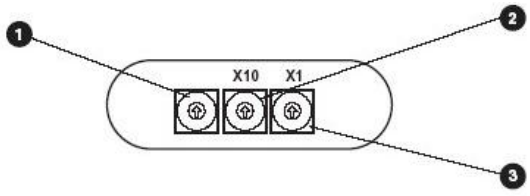
I/O Platform Advantys FTB

1

Assign the CANopen address and transfer rate for Advantys FTB

The **CANopen address** and **transfer rate** are set manually on the modules via **rotary switches**. There are two rotary switches for the address and one for the transfer rate.

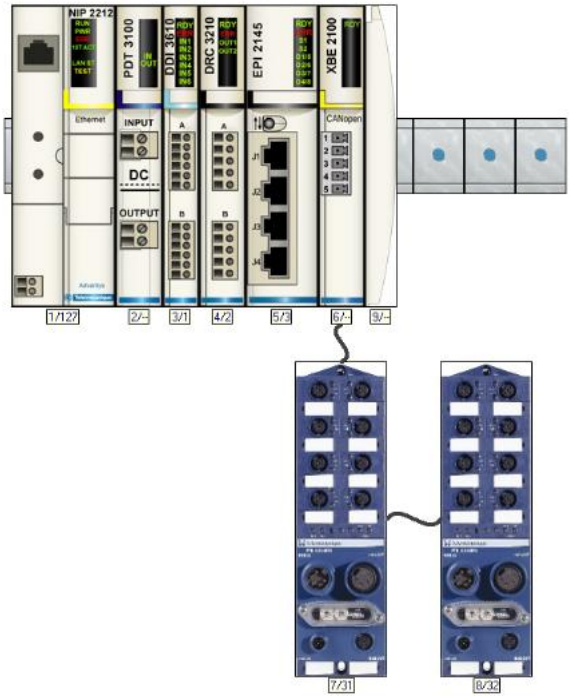
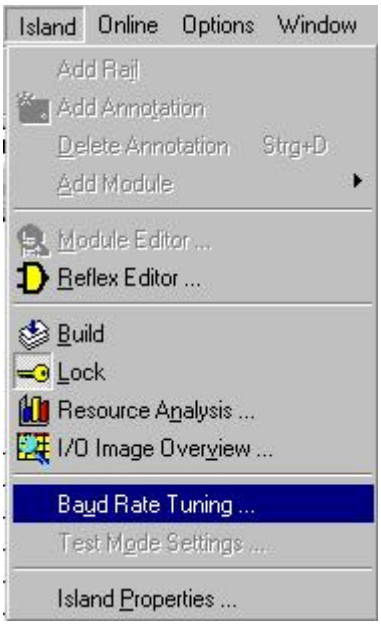
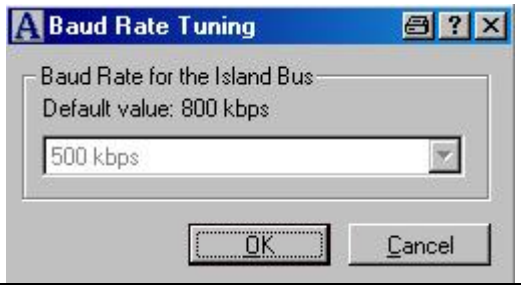
In our example the two/three FTB modules have the **addresses 31 and 32 or 30 to 32** respectively, and the transfer rate is **500 kbps**.



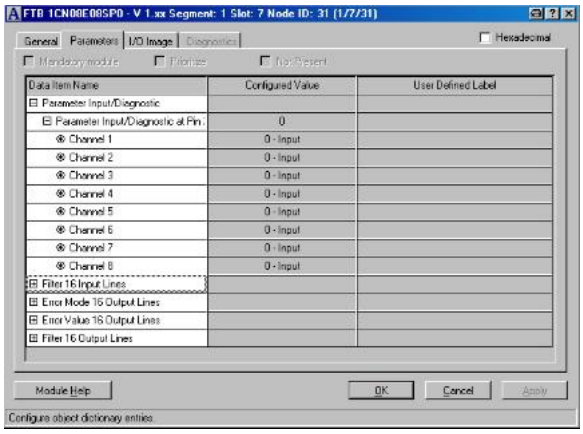
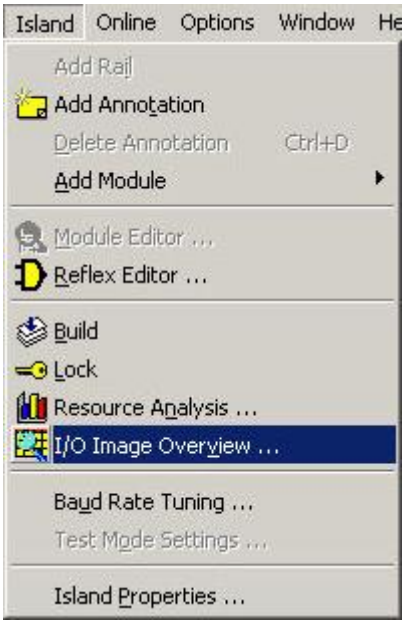
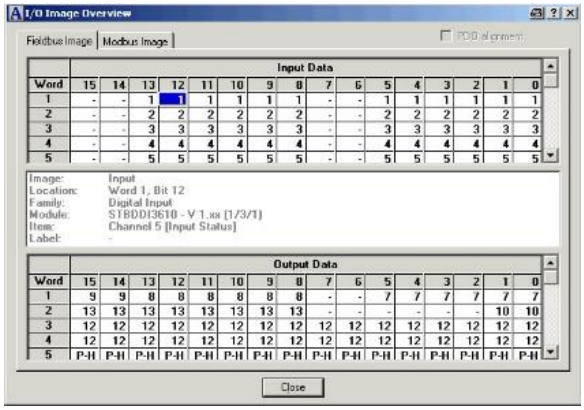
Element	Function
1	Transmission speed (kBit/s)
2	Node-ID x 10 switch
3	Node-ID x 1 switch

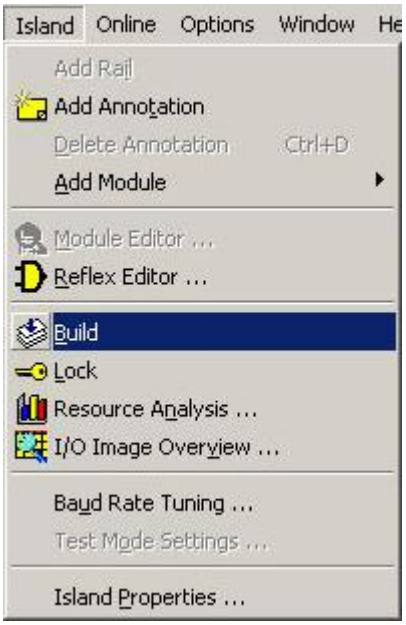
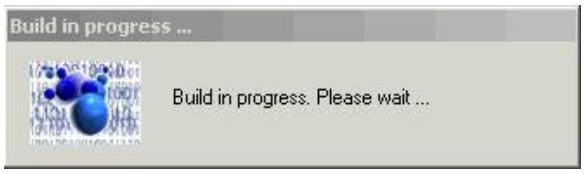
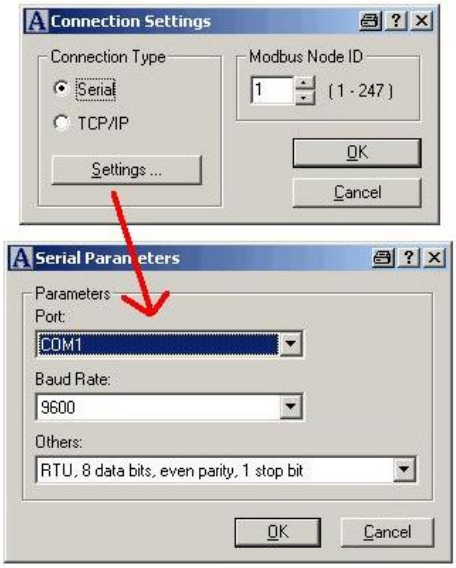
Position of the encoder wheel	Transmission speed
O	Automatic recognition
1	10 kBits/s
2	20 kBits/s
3	50 kBits/s
4	100 kBits/s
5	125 kBits/s
6	250 kBits/s
7	500 kBits/s
8	800 kBits/s
9	1 Mbits/s

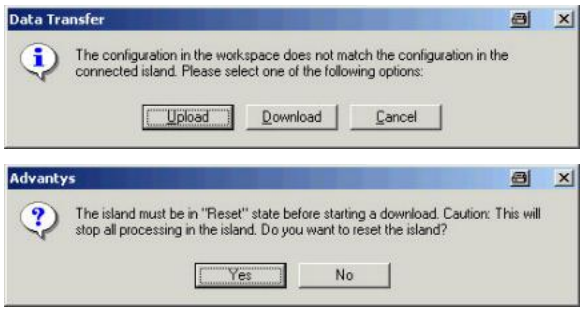
I/O Platform Advantys FTB
Ctd.

2	**Configure the STB CANopen extension** Finally, the CANopen extension is configured by selecting the devices in the catalog under “Extended CANopen”. These are, for example: FTB 1CN 08E08SP0 8 inputs/8 outputs Or FTB 1CN 12E04SP0 12 inputs/4 outputs Or ATV31 Addressing on the extension is performed automatically in accordance with the sequence on the bus. If specific addresses are required, the devices should be moved or the maximum start address should be changed.	
3	**CANopen settings** The **baud rate** can be set via the menu bar. In this example the rate used is **500 kbps**. The baud rate depends on the modules used and how they are distributed. The CANopen specification should be observed.	 

I/O Platform Advantys FTB
Ctd.

4	**Adjust the device parameters** Double-click on the device to open the **Parameters window**. The setting for the FTB modules is shown here, for example. The entry is made in the **Value** field. **Note for FTB module:** The diagnostic parameters for the individual channels are activated **as standard** (**value 1**). To use pin 2 for optional inputs, you must **change the value to 0**. In our example channels 1 to 8 are set to 0.	It is possible to specify parameters for the individual devices on the CANopen extension, which are transferred to the devices every time the bus is restarted. 
5	**I/O data image** You can use **I/O Image Overview...** in the **Island** menu or the equivalent icon to call the function for assigning the I/O to the memory areas.	
6	**I/O data image** The information concerning the selected data is displayed in the description field. Alternatively, the project can also be printed out. The printout will contain the same information. • Advantys STB/FTB inputs from 45392 to 45411 • PLC -> HMI inputs from 49488 to 49492 • Advantys STB/FTB outputs from 40001 to 40004 • HMI -> PLC outputs from 44097 to 44101	

7	**Build** First you need to generate a downloadable version from the completed configuration. To do this, select **Island → Build** or click the corresponding icon.	
8	**Build** An information window will be displayed while the build is in progress. Once the build process is complete, a message will be displayed informing you of whether or not the operation was successful.	
9	**Connection settings** If this is the first time that a connection to the island has been established, start by specifying the connection settings. This is done by selecting **Connection Settings** from the **Online** menu. In the case of a serial link, the settings must be made as in the screenshot shown here and must be compatible with the island. Alternatively, if an IP address already exists, a connection via TCP/IP can be parameterized.	

10	**Connect** You can now establish a connection to the island by selecting **Connect** from the **Online** menu or by pressing the equivalent button. **Note:** If no build operation has yet been performed, the software will now initiate an automatic build.	
11	**Data transfer** **Application download** Once the connection has been established, the Advantys software will detect that the version generated does not match the current configuration in the island and will present you with an option to Download or Upload. After selecting **Download**, confirm the security prompt.	
12	**Application download** A progress bar will be displayed during download. Once the download is complete, the island will perform a reset and the connection will be interrupted. Once you have confirmed the prompt, re-establish the connection with the island.	

I/O Platform Advantys FTB
Ctd.

13	**Start application - RUN** Once the connection has been re-established, you can start the island by selecting **Run** from the **Online** menu or pressing the equivalent icon in the toolbar.	
14	**Start application - RUN** Confirm the prompt. Following successful startup, the following message will appear in the output window: "No errors. Island fully operational." ("Island is healthy").	

TeSysU

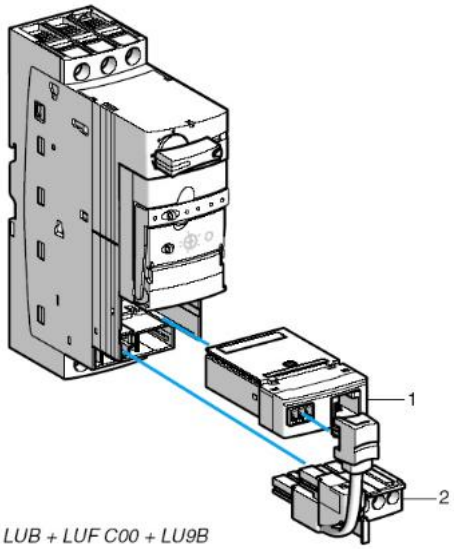
Introduction

This chapter presents the motor starter (TeSysU) components used in this system. They can be adapted according to the application (motor output, reversing or non-reversing drive).

Basically, the TeSys U motor control unit comprises:

- Power base
- Control unit
- Communication module
- Coil wiring kit
- Optional: reversing block, I_s limiter/isolation block and other modules

TeSysU

1	**TeSysU** **Power base** LUB12 **Control unit** LUCB 05 BL **Communication module with parallel wiring (1)** LUF C00 **Coil wiring kit (2)** LU9B N11C	 *LUB + LUF C00 + LU9B*
2	**Note**	The LUF C00 module with parallel wiring enables motor controls to be connected to the I/O modules of PLCs quickly and without the need for tools. It replaces conventional systems using a screw terminal block and single-conductor wiring. The module with parallel wiring collects all information regarding the states and control commands of each motor control. The connection module distributes information from the PLC I/O modules to each connected motor control.
3	**Note**	The following points should be taken into account when selecting components. 1. A 24 V DC LUCx xx BL control unit must be used. Make sure it has the BL extension. 2. There are different versions of the coil wiring kit, which depend on the power base. LU9B N11C should be used if the power base has one direction of rotation (LUBxx) and LU9M RC should be used if the power base has two directions of rotation (LU2Bxx).

Altivar ATV31

Introduction

The settings for the ATV31 variable speed drive can either be made manually using the control buttons on the device or by means of the PowerSuite configuration software.

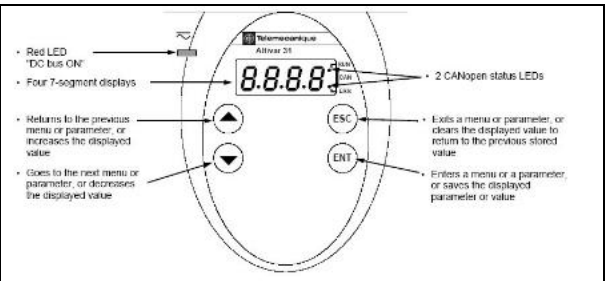
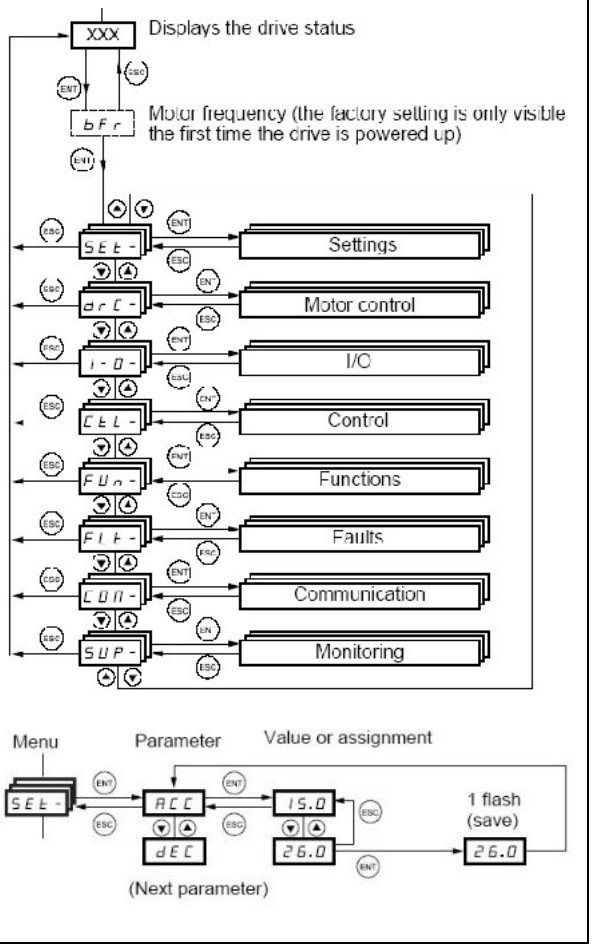
The advantages of using PowerSuite are that you

- Can save the data on your PC and copy it as you wish
- Can print out the documentation *and* receive help to optimize the parameters online.

The Altivar 31 comes with a product CD containing the device documentation (installation and programming instructions) together with a light version of PowerSuite, which makes it quick and easy to parameterize the drive.

Setting up Manually

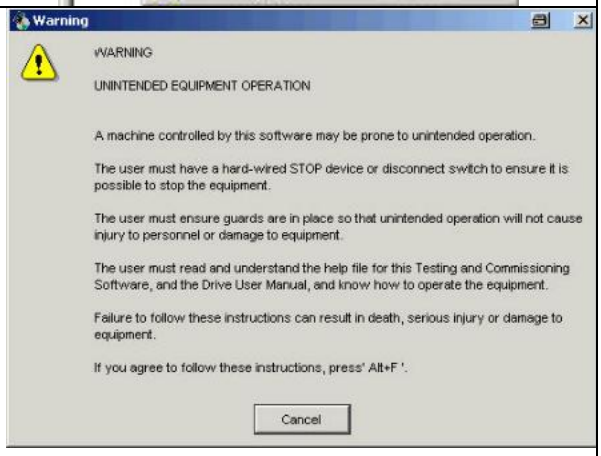
The ATV31 parameters can also be entered or modified via the front panel. This section describes how to set the drive using the control buttons.

ATV31 on CANopen Extension	**1**	The CANopen address and transfer rate are set manually via the **control buttons** on the device.	
	2	First, use the control buttons to select the **Communication** submenu.	
	3	In the **Communication** menu, the **CANopen address** must be set in the **AdC0** parameter. In the example software provided, the values **31/31** and **27 to 30** have been set aside for the two/four drives on the drive island respectively.	
	4	In the **Communication** menu, you must also set the transfer rate in the **BdC0** parameter to the value **500.0** (**kbits**).	
	5	Alternatively, the address and transfer rate can also be parameterized using the PowerSuite configuration software.	

Settings with PowerSuite

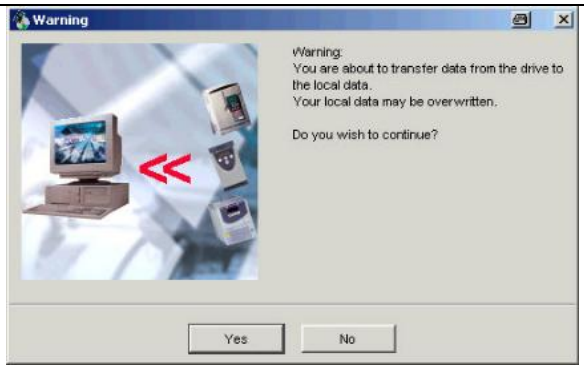
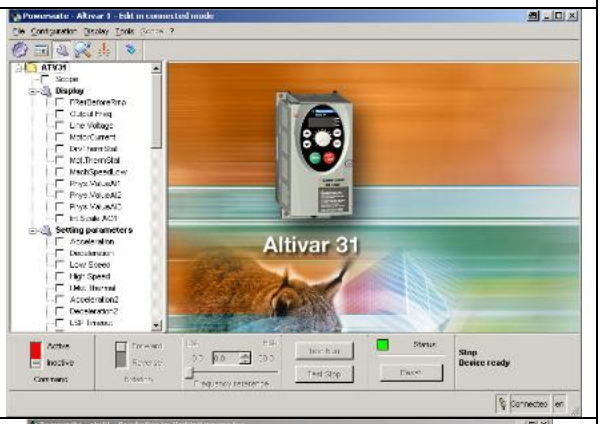
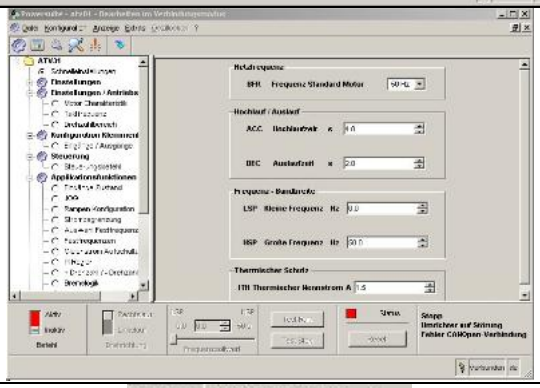
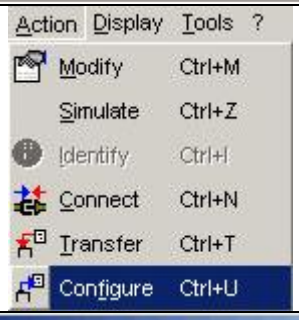
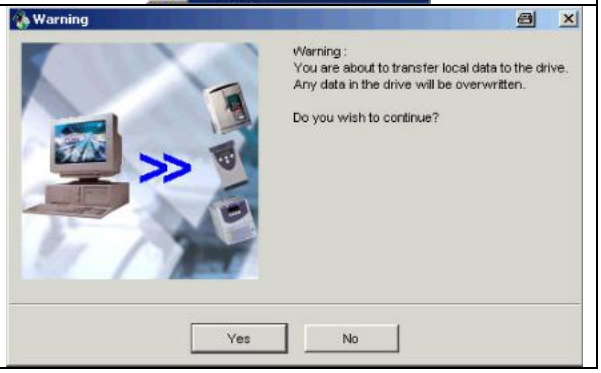
The altivar parameters can also be set using the PowerSuite configuration software. This section describes the PowerSuite software option.

Parameter Settings

1	After starting the software, use the **Connect** option in the **Action** menu or the equivalent button to establish a connection with the device. **Note:** Prior to this, you must have plugged the connection cable running between the PC and ATV into the **PowerSuite** port on the junction box. Only one drive can be connected to the box's **ATV1** input.	
2	Before the connection is established, you must confirm that you accept the terms of the security warning by pressing **ALT+F**.	
3	Next, you need to enter the name of the configuration or device.	

Continued on next page

Parameter Settings Ctd.

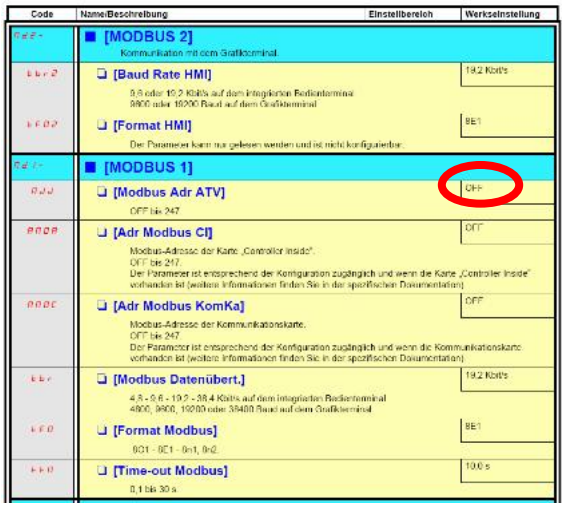
4	You must confirm the following warning concerning the transfer of parameters. The current parameters will then be transferred from the drive to the software.	
5	Once the transfer is complete, the drive's online screen will appear. In order to make parameter settings, you must switch to the configuration screen.	
6	In the configuration screen, you must, as a minimum, check the line frequency parameters (**BFR**) and **motor parameters** (Settings/Drive Parameters – Motor Characteristics) and adjust them as necessary.	
7	Next, close the configuration view and, in the main window, transfer the data to the drive by selecting **Configure** from the **Action** menu or by pressing the equivalent button.	
8	To start the transfer, confirm the warning message.	

Altivar ATV71

Introduction

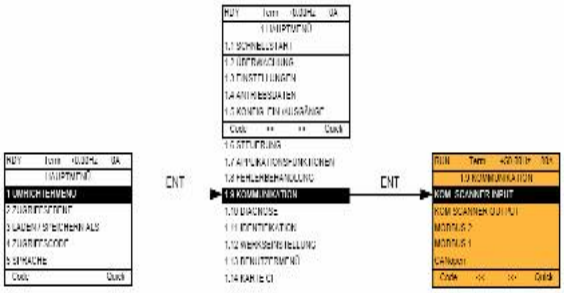
You can set the ATV71 variable speed drive manually, using the control buttons on the device, with the PowerSuite Launch ATV71 configuration software (currently available only in English and French), or using a Web server (if the drive has an Ethernet option card). This section describes how to set the communication parameters manually, via the operator panel. You need to do this in order to enable parameter setting via the software. Then the parameterization option using the PowerSuite software is described.

ATV71 Manual Setup

1	**ATV71** installation manual: (A PDF is supplied with the ATV71 on CD). The **Modbus addresses** on the interface are **factory-set** to **OFF**, i.e., the interface is inactive.	

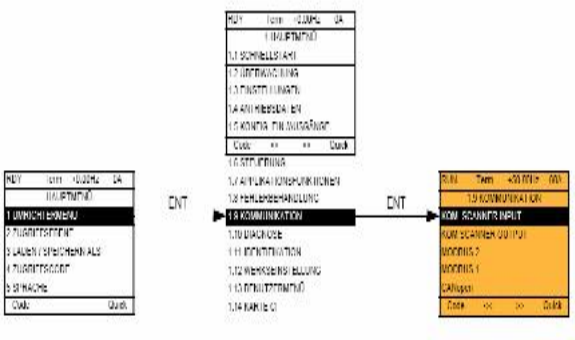
Modbus Communi-cation Port

Manual Setting

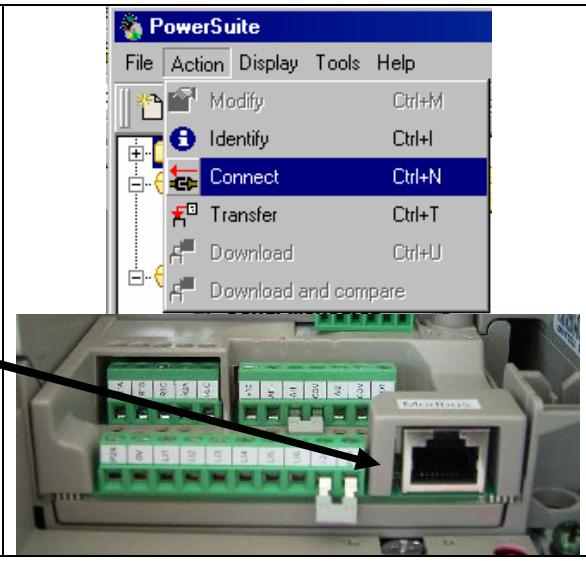
1	From the main menu on the **ATV71 operator panel**, select →**1.Drive Menu** →**1.9 Communication** →**Modbus Network** →**Modbus Address** = OFF → Press the selector switch to confirm. → Turn the selector switch to **MB-ADR = 1** and → Press the selector switch to confirm.	

Ethernet Communi-cation Port

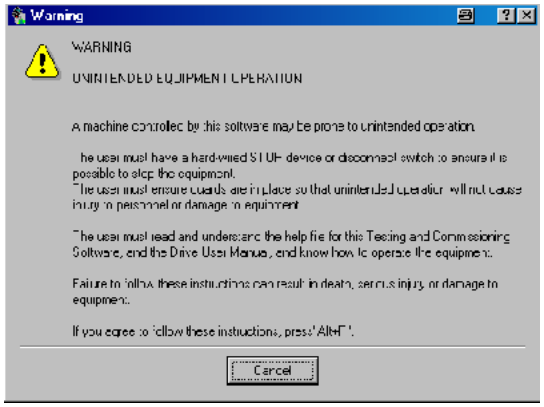
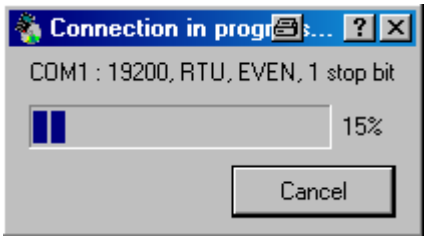
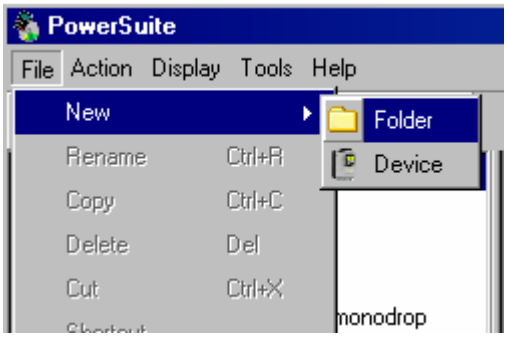
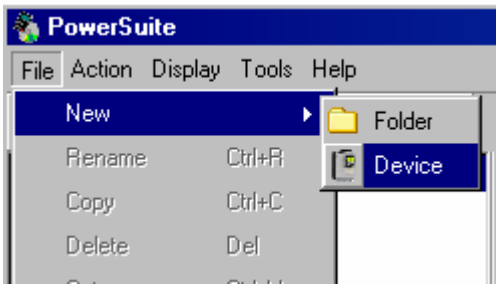
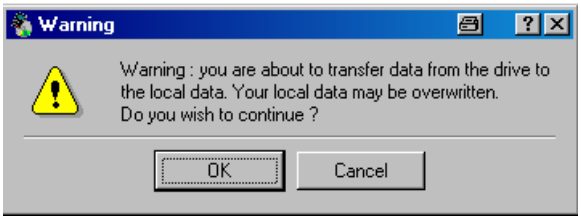
Manual Setting (Alternative)

2	From the main menu on the **ATV71 graphic terminal**, select →**1. Drive Menu** →**1.9 Communication** → **Ethernet** → **The bit rate is detected automatically (10/100 mbps)** →Turn the selector switch to **IP Card = 192.168.100.65** and → Press the selector switch to confirm. →Turn the selector switch to **IP Mask = 255.255.255.0** and → Press the selector switch to confirm.	

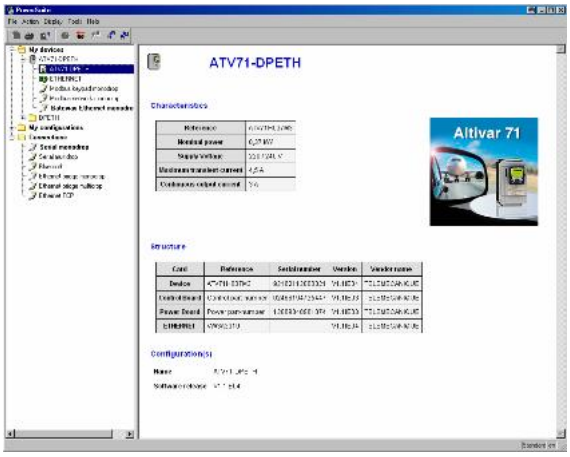
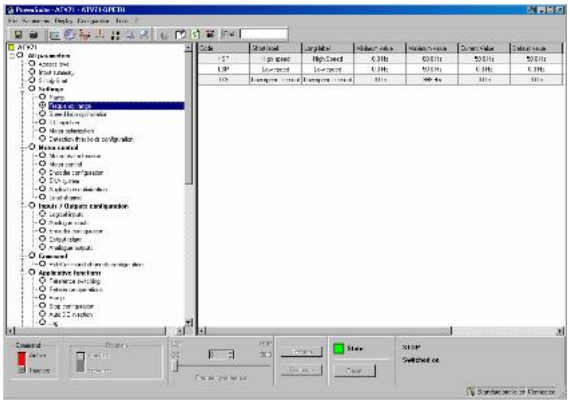
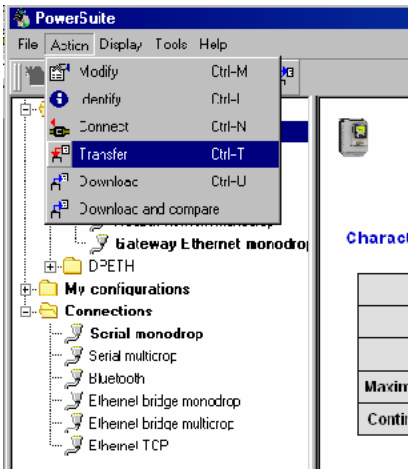
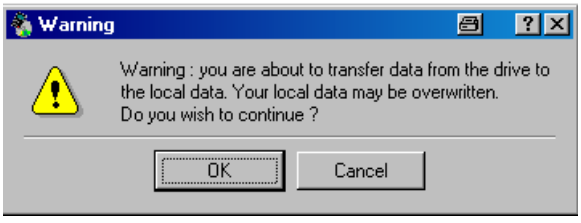
Parameter Settings with PowerSuite Launch ATV71

1	After starting PowerSuite, use the **Connect** option in the **Action** menu or the equivalent button to establish a connection with the device. **Note:** Prior to this, you must have plugged the connection cable running between the PC and ATV71 into the Modbus port on the ATV71 (RJ45) and selected the **Connection type**. In our example it is → **Serial Monodrop**	

Parameter Settings Ctd.

2	Before the connection is established, you must confirm that you accept the terms of the security warning by pressing **ALT+F**. Then the connection is established.	 
3	Next, you need to enter the name of the configuration or device.	 
4	You must confirm the following warning concerning the transfer of parameters. The current parameters will then be transferred **from** the drive to the software.	

Parameter Settings Ctd.

5	Once the transfer is complete, the drive's online screen will appear. In order to make parameter settings, you must switch to the configuration screen.	
6	In the **configuration screen**, you must, as a minimum, check the line frequency parameters (**HSP**) and **motor parameters** (Settings/Drive Parameters – Motor Characteristics) and adjust them as necessary.	
7	Next, close the configuration view and, in the main window, transfer the data **to** the drive by selecting **Configure** from the **Action** menu or by pressing the equivalent button. (**Action→Transfer**).	
8	To start the transfer, confirm the warning message.	

ConneXium Switch NES27100

Introduction

You can assign a unique IP address to the "manageable" Ethernet switch NES27100 in order to carry out diagnostics and parameterization via Ethernet. The NES27100 has seven Ethernet ports for communication and a serial V24 interface for parameterization.

Five Ethernet ports are set to "autonegotiate" as standard, i.e., there is no restriction on transfer rates (10/100 MB/s). Ports 6 and 7 have to be activated by the terminal program (e.g. MS Windows Hyperterminal) as they are set to 100 MB/s as standard.

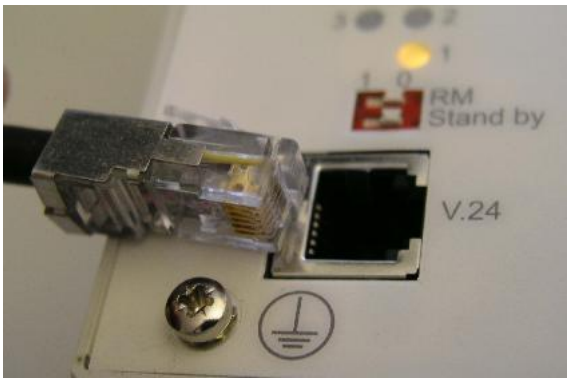
There are two ways of parameterizing the NES27100:

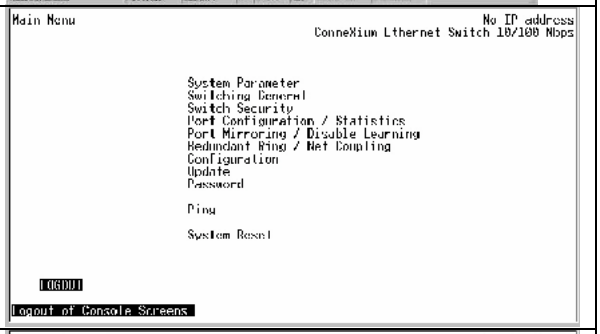
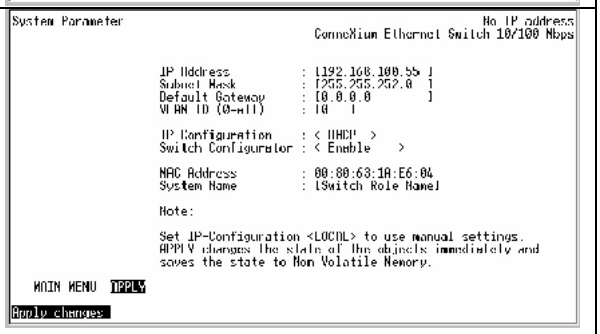
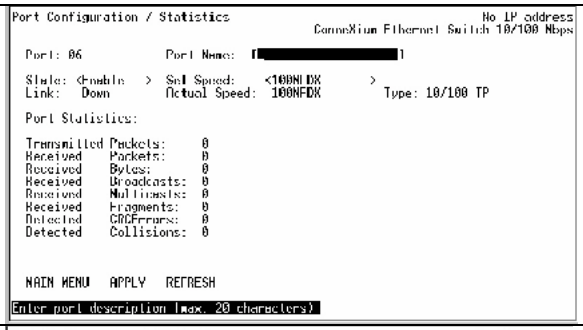
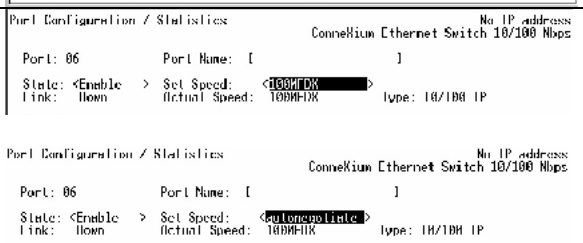
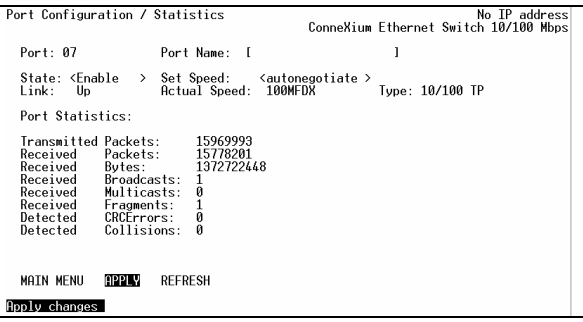
- Serial PC access via the terminal program
- Ethernet PC access to the NES27100 Web server via Internet Explorer

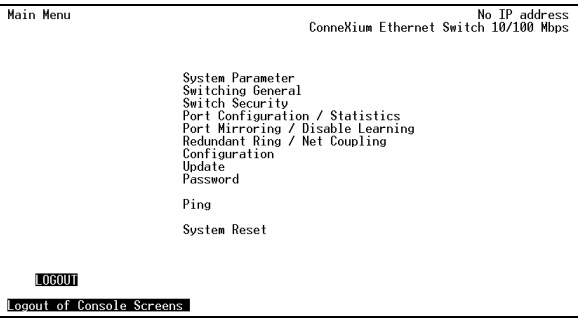
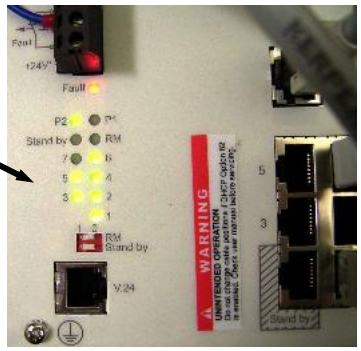
The serial access method is described below:

- **Set terminal program interface**
- **Log in to the NES27100 user interface**
- **Main menu**
- **Parameterize the IP address**
- **Parameterize the Ethernet port**
- **Save the switch parameters**
- **Log out**
- **Initialize the switch**
- **Starting characteristics**

Set Terminal Program Interface

1	You will need the switch initialization cord **490NTRJ11** to connect the PC to the Ethernet switch NES27100 **(PC COM=Sub-D9 → NES-V24= RJ11)** PC interface parameters required: Baud rate: **9600 baud (NxS)** Data: **8 bits** Stop bit: **1 bit** Handshake: **Off** Parity: **None**	 

Log in to the NES27100 User Interface	**2**	After connecting the PC to the switch, press Return to open the **Login Screen** for the switch. Enter • User: **admin** • Password: **private** to open the Main Menu.	
Main Menu	**1**	Main menu: Next, select the **System Parameter** menu option to assign the IP address.	
Parameterize the IP Address	**2**	In the **System Parameter** screen you can assign the **IP address**: in the example: **192.168.100.55** and the **subnet mask**: **255.255.252.0**. Click **Apply** to confirm the inputs.	
Parameterize the Ethernet Ports 6 and 7	**3**	In the **Port Configuration / Statistics** screen you can parameterize the individual interfaces. Pay particular attention to the **transfer speed** (10/100 MB/s), which is not the same for all SE products.	
	4	Here ports 6 and 7 are changed from the default setting 100 MB/s to **autonegotiate**.	
Save the Switch Parameters	**5**	After making the parameter settings in one of the switch configuration screens, you must apply the values to save them to the switch memory.	

Log Out	**6**	When you have completed the parameter settings, press **LOGOUT** to leave the Ethernet switch configuration screen (**main menu**).	
Initialize the Switch	**7**	Finally, you must run a "**power cycle**" (power **OFF/ON**) to reinitialize the switch.	
Starting Characteristics	**8**	After running a **power cycle** (power **OFF/ON**) on the Ethernet switch **NES27100**, it will take approximately **60** seconds for communication to be restored to all ports.	During initialization, all ports are tested in succession in two stages before Ethernet communication is enabled. 

Appendix

Detailed Component List

Explanation of the item number structure(x.y.z):

- **Digit 1 indicates the location (e.g., 1 corresponds to the main cabinet)**
- **Digit 2 indicates the function unit (e.g., 1.2 corresponds to the PLC)**
- **Digit 3 indicates individual components of the function unit (e.g., 1.2.3 corresponds to the PLC CPU)**

Hardware Components

Pos.	Amt.	Description	Part Number	Rev./ Vers.
1.		**Main control cabinet**		
1.1.1	1	3-pole 36 kA compact master switch, NS100 N	29003	
1.1.2	1	3-pin terminal cover	29321	
1.1.3	1	3-pin 12-16 A release block, TM16D	29035	
1.1.4	1	230 V undervoltage release	29407	
1.1.5	1	Undervoltage release fuse 1 A (type C MCB) and 230 V load contactor	23725	
1.1.6	1	Alarm accessories 1 NC contact	29450	
1.1.7	1	Fixed locking device	29371	
1.1.8	1	Emergency-off switch	XALK174-G	
1.1.9	1	Preventa category 4 safety relay	XPSAF5130	
1.1.10	1	Emergency-off fuse (2A)	25021	
1.1.11	2	Redundant load contactor	LC1D18P7	
1.1.12	1	ACK and safety indicator pushbutton activated	XB5AW-36M5	
1.1.13	1	Single-pushbutton housing	XALD01	
1.2.0	1	Rack, 8 slots	TSXRKY8EX	
1.2.1	1	Terminating resistors A and B for X-bus	TSXTLYEX	
1.2.2	1	Premium power supply	TSXPSY2600	
1.2.3	1	CPU with Ethernet	TSXP572634	
1.2.4	1	CANopen master module for Premium	TSXCPP110	
1.2.5	1	CANopen connector	TSXCANKCDF 90TP	
1.2.6	2	Digital inputs (16-point)	TSXDEY16D2	
1.2.7	2	20-pin terminal block for I/O cards	TSXBLY01	
1.2.9	2	2A flink input fuse (C60H 1p C2)	25021	
1.2.10	2	Digital outputs (16-point, 0.5 A transistor)	TSXDSY16T2	
1.2.11	2	20-pin terminal block for I/O cards	TSXBLY01	
1.2.12	2	2A flink output fuse (C60H 1p C2)	25021	
1.3.1	1	Magelis XBTG with Ethernet	XBTG2330	
1.3.2	1	Twisted pair patch cable, RJ45, 2m	490NTW00002	
1.3.3	1	2 A fuse for Magelis (C60H 1p., 2A C)	24886	
1.3.5	1	TF switch, 7x 10T/100TX, IP20	499NES27100	
1.3.7	7	Twisted pair patch cable, RJ45, 5m	490NTW00005	
1.4.1	1	2 A fuse for Ethernet comp. (C60H 1p., 2A C)	25021	

1.4.2	1	Power supply, general, 240 V AC 1-phase, 24 V DC 5A	ABL7RE2405	
1.4.3	1	Power supply, Ethernet comp., 240 V AC 1-phase, 24 V DC 3A	ABL7RE2403	
1.4.4	1	Secondary fuse C60N 1P C3 A	25022	
1.5.1	2	TeSys U power base, 12A (no reversing starter)	LUB12	
1.5.2	2	Release block 0.25 to 1.5 kW	LUCA05BL	
1.5.3	2	Parallel wiring module for TeSys U	LUFC00	
1.5.5	2	Coil wiring kit	LU9BN11C	
1.6.1	2	0.37 kW 3-phase AC variable speed drive	ATV31H037N4	
1.6.2	2	Motor circuit breaker 2.5 A	GV2L07	
1.6.3	2	Contactor LC1D09BD	LC1D09BD	
1.6.4	2	Auxiliary-switch attachment	GVAE11	
1.6.5	1	CANopen junction box	VW3CANTAP2	
1.6.6	2	CAN bus connection cable 1 m	VW3CANCAR R1	
1.6.7	2	Remote cabinet power supply fuse C60N, 3p, B16A	23652	

2.		**Distributed island 1**		
2.1.1	1	Advantys STB Ethernet station	STBNIP2212	
2.1.2	1	24 V power connector	STBXTS1120	
2.1.3	1	Twisted pair patch cable, RJ45, 2m	490NTW00002	
2.1.4	1	24 V voltage feed module	STBPDT3100	
2.1.5	1	Rack for STBPDT3100	STBXBA2200	
2.1.6	1	24 V input card	STBDDI3610	
2.1.7	1	Rack for STBDDI3610	STBXBA1000	
2.1.8	1	Input connector set (pack size = 20 units)	STBXTS1100	
2.1.9	1	24 V transistor output card	STBDDO3200	
2.1.10	1	Rack for STBDDO3200	STBXBA2000	
2.2.11	1	Group interface for TeSys U	STBEPI2145	
2.1.12	1	Rack	STBXBA3000	
2.1.13	1	Internal terminating resistor for island	STBXMP1100	
2.1.14	1	24 V power supply fuse, C60H, 1p, C2A	MG 24886	
2.2.1	1	Magelis XBTG2330 with Ethernet on board	XBTG2330	
2.2.2	1	Twisted pair patch cable, RJ45, 2m	490NTW00002	
2.2.3	1	2 A fuse for Magelis (C60H 1p., 2A C)	MG 24886	
2.2.4	1	TF switch, 8-way, with 10/100 Mbit, IP20	499NES18100	
2.2.5	1	Twisted pair patch cable, RJ45, 2m	490NTW00002	
2.2.6	1	1 A fuse for Ethernet comp. (C60H 1p., 1A C)	MG 25020	
2.2.7	1	Power supply, general, 240 V AC 1-phase, 24 V DC 5A	ABL7RE2405	
2.2.7	1	Secondary fuse C60N 1P C3 A	25022	
2.3.1	2	TeSys U power base, 12A (no reversing starter)	LUB12	
2.3.2	2	Release block 0.25 to 1.5 kW	LUCA05BL	
2.3.4	2	Parallel wiring module for TeSys U	LUFC00	
2.3.5	2	Connecting cable 1m	LU9R10	
2.3.6	2	Coil wiring kit	LU9BN11C	
2.4.1	1	0.75 kW 3-phase AC variable speed drive	ATV71HU75N4	
2.4.2	1	Ethernet interface module for Altivar	VW3A3310	
2.4.3	1	Motor circuit breaker 4 A	GV2L08	
2.4.4	1	Auxiliary-switch attachment	GVAE11	
2.4.5	1	Remote cabinet power supply fuse C60N, 3p, B16A	23652	

2.5.1	1	Pull-wire switch for emergency-off	XY2CH13270H29	
2.5.2	1	Emergency-off switch housing	XALK174-G	
2.5.3	1	Safety analyzing unit	XPSAK311144PP	
2.5.4	1	ACK and safety indicator pushbutton activated	XB5AW-36B5	
2.5.5	1	Single-pushbutton housing	XALD01	
2.5.6	2	Redundant load relay for safe shutdown	LC1D09BD	

3.		**Distributed island 2**		
3.1.1	1	Advantys STB Ethernet station	STBNIP2212	
3.1.2	1	24 V power connector	STBXTS1120	
3.1.3	1	Twisted pair patch cable, RJ45, 2m	490NTW00002	
3.1.4	1	24 V voltage feed module	STBPDT3100	
3.1.5	1	Rack for STBPDT3100	STBXBA2200	
3.1.6	1	24 V input card	STBDDI3610	
3.1.7	1	Rack for STBDDI3610	STBXBA1000	
3.1.8	1	Input connector set (pack size = 20 units)	STBXTS1100	
3.1.9	1	24 V transistor output card	STBDDO3200	
3.1.10	1	Rack for STBDDO3200	STBXBA2000	
3.1.11	1	Group interface for TeSys U	STBEPI2145	
3.1.12	1	Rack	STBXBA3000	
3.1.13	1	Remote CANopen master	STBXBE2100	
3.1.14	1	Rack for STBXBE2100	STBXBA2000	
3.1.15	1	Internal terminating resistor for island	STBXMP1100	
3.1.16	1	Spare fuses for island, 5 A/10 A	STBXMP5600	
3.1.17	1	24 V power supply fuse, C60H, 1p, C2A	24886	
3.2.1	1	Magelis panel XBTN 400 via Modbus	XBTN401	
3.2.2	1	Connection cable to control system	XBTZ988	
3.2.3	1	1 A fuse for Magelis (C60H 1P C)	25020	
3.3.1	1	Power supply, general, 240 V AC 1-phase, 24 V DC 5A	ABL7RE2405	
3.3.2	1	Primary fuse C60N 2P 1A	GB2-DB06	
3.4.1	2	0.37 kW 3-phase AC variable speed drive	ATV31H037N4	
3.4.2	2	Motor circuit breaker 2.5 A	GV2L07	
3.4.3	2	Contactor LC1D09BD	LC1D09BD	
3.4.4	2	Auxiliary-switch attachment	GVAE11	
3.4.5	1	CANopen junction box	VW3CANTAP2	
3.4.6	2	CAN bus connection cable 1 m	VW3CANCARR1	
3.4.7	2	Remote cabinet power supply fuse C60N, 3p, B16A	23652	
3.5.1	1	Preventa category 4 safety relay	XPSAF5130	
3.5.2	1	EMERGENCY OFF MASTER SWITCH	VCF02GE	

4.		**Distributed island 3**		
4.1.1	1	Power supply, general, 240 V AC 1-phase, 24 V DC 5A	ABL7RE2405	
4.1.2	1	Secondary fuse C60N 1P C3 A	25022	
4.2.1	3	Bus module with 8 inputs/8 outputs	FTB1CN08E08SPO	
4.2.2	2	Connection cable 1m M12	FTXCN3210	
4.2.3	1	Connection cable 1m, M12 with free end	FTXCN3230	
4.2.4	1	Diagnostic adapter M12	FTXDG12	
4.2.5	2	Connection cable 30 cm 7/8"	FTXDP2210	
4.2.6	1	Connection cable 2m, 7/8" with free end	FTXDP2115	

4.2.7	1	Terminating resistor	FTXCNTL12	
4.2.8	1	7/8" sealing cap IP67 (socket)	FTX78B	
4.2.9	1	M12 sealing caps IP67 (10 units)	FTXCM12B	
4.2.10	1	24 V outgoing power supply fuse, C60H, 1p, C2A	24886	
4.3.1	1	Advantys STB Ethernet station	STBNIP2212	
4.3.2	1	24 V power connector	STBXTS1120	
4.3.3	1	Twisted pair patch cable, RJ45, 2m	490NTW00002	
4.3.4	1	24 V voltage feed module	STBPDT3100	
4.3.5	1	Rack for STBPDT3100	STBXBA2200	
4.3.6	1	24 V input card	STBDDI3610	
4.3.7	1	Rack for STBDDI3610	STBXBA1000	
4.3.8	1	Input connector set (pack size = 20 units)	STBXTS1100	
4.3.9	1	24 V relay output card	STBDRC3210	
4.3.10	1	Rack for STBDRC3210	STBXBA2000	
4.3.11	1	Remote CANopen master	STBXBE2100	
4.3.12	1	Rack for STBXBE2100	STBXBA2000	
4.3.13	1	Internal terminating resistor for island	STBXMP1100	
4.4.1	1	TF hub, 4-way, with 10 Mbit, IP65	499NEH10410->IP65?	
4.5.1	1	EMERGENCY OFF MASTER SWITCH	VCF02GE	

5.		**Distributed island 4**		
5.1.1	1	Power supply, general, 240 V AC 1-phase, 24 V DC 5A	ABL7RE2405	
5.1.2	1	Secondary fuse C60N 1P C3 A	25022	
5.2.	2	Bus module with 8 inputs/8 outputs	FTB1CN08E08SPO	
5.2.2	1	Connection cable 1m M12	FTXCN3210	
5.2.3	1	Connection cable 1m, M12 with free end	FTXCN3230	
5.2.4	1	Diagnostic adapter M12	FTXDG12	
5.2.5	1	Connection cable 30 cm 7/8"	FTXDP2210	
5.2.6	1	Connection cable 2m, 7/8" with free end	FTXDP2115	
5.2.7	1	Terminating resistor	FTXCNTL12	
5.2.8	1	7/8" sealing cap IP67 (socket)	FTX78B	
5.2.9	1	M12 sealing caps IP67 (10 units)	FTXCM12B	
5.2.10	1	24 V outgoing power supply fuse, C60H, 1p, C2A	24886	
5.3.1	1	Advantys STB Ethernet station	STBNIP2212	
5.3.2	1	24 V power connector	STBXTS1120	
5.3.3	1	Twisted pair patch cable, RJ45, 2m	490NTW00002	
5.3.4	1	24 V voltage feed module	STBPDT3100	
5.3.5	1	Rack for STBPDT3100	STBXBA2200	
5.3.6	1	24 V input card	STBDDI3610	
5.3.7	1	Rack for STBDDI3610	STBXBA1000	
5.3.8	1	Input connector set (pack size = 20 units)	STBXTS1100	
5.3.9	1	24 V relay output card	STBDRC32100	
5.3.10	1	Rack for STBDRC3210	STBXBA2000	
5.3.11	1	Remote CANopen master	STBXBE2100	
5.3.12	1	Rack for STBXBE2100	STBXBA2000	
5.3.13	1	Internal terminating resistor for island	STBXMP1100	
5.4.1	4	Variable speed drive 0.18 kW/2.2 A	ATV31H018M2	
5.4.2	2	Junction box for connecting ATV to CANopen bus	VW3CANTAP2	
5.4.3	4	Connection cable for connecting ATV31 to junction box	VW3CANRR1	
5.4.4	1	Communication cable for communication between ATV31 and PowerSuite	VW3A8106	

5.5.1	1	TF hub, 4-way, with 10 Mbit, IP65	499NEH10410->IP65?	
5.6.1	1	EMERGENCY OFF MASTER SWITCH	VCF02GE	
5.7.1	1	Magelis panel XBTN 400 via Modbus	XBTN401	
5.7.1	1	HMI cable to Advantys STB	XBTZ988	

6.		**Distributed island 5**		
6.1.1	1	Power supply, general, 240 V AC 1-phase, 24 V DC 5A	ABL7RE2405	
6.1.3	1	Secondary fuse C60N 1P C10A	23650	
6.2.1	2	Bus module with 8 inputs/8 outputs	FTB1CN08E08SPO	
6.2.2	1	Connection cable 1m M12	FTXCN3210	
6.2.3	1	Connection cable 1m, M12 with free end	FTXCN3230	
6.2.4	1	Diagnostic adapter M12	FTXDG12	
6.2.5	1	Connection cable 30 cm 7/8"	FTXDP2210	
6.2.6	1	Connection cable 2m, 7/8" with free end	FTXDP2115	
6.2.7	1	Terminating resistor	FTXCNTL12	
6.2.8	1	7/8" sealing cap IP67 (socket)	FTX78B	
6.2.9	1	M12 sealing caps IP67 (10 units)	FTXCM12B	
6.2.10	1	24 V outgoing power supply fuse, C60H, 1p, C2A	24886	
6.3.1	1	Advantys STB Ethernet station	STBNIP2212	
6.3.2	1	24 V power connector	STBXTS1120	
6.3.3	1	Twisted pair patch cable, RJ45, 2m	490NTW00002	
6.3.4	1	24 V voltage feed module	STBPDT3100	
6.3.5	1	Rack for STBPDT3100	STBXBA2200	
6.3.6	1	24 V input card	STBDDI3610	
6.3.7	1	Rack for STBDDI3610	STBXBA1000	
6.3.8	1	Input connector set (pack size = 20 units)	STBXTS1100	
6.3.9	1	24 V relay output card	STBDRC3210	
6.3.10	1	Rack for STBDRC3210	STBXBA2000	
6.3.11	1	Group interface for TeSys U	STBEPI2145	
6.3.12	1	Rack	STBXBA3000	
6.3.13	1	Remote CANopen master	STBXBE2100	
6.3.14	1	Rack for STBXBE2100	STBXBA2000	
6.3.15	1	Internal terminating resistor for island	STBXMP1100	
6.4.1	4	Release block 0.25 to 1.5 kW	LUCA05BL	
6.4.2	4	Parallel wiring module for TeSys U	LUFC00	
6.4.3	4	Coil wiring kit	LU9BN11C	
6.4.4	4	Connecting cable 1m	LU9R10	
6.5.1	1	TF hub, 4-way, with 10 Mbit, IP65	499NEH10410->IP65?	
6.6.1	1	EMERGENCY OFF MASTER SWITCH	VCF02GE	
6.7.1	1	Magelis panel XBTN 400 via Modbus	XBTN401	
6.7.1	1	HMI cable to Advantys STB	XBTZ988	

Software Components

Pos.	Amt.	Description	Part Number	Rev./ Vers.
7.1	1	Unity Pro XL single-user license	UNYSPUEFUCD20	**V2.02**
7.2	1	Unity USB programming cable	UNYXCAUSB0330	
7.3	1	ADVANTYS software incl. RS232 cable	STBSPU1000	**V2.00**
7.4	1	Premium programming cable and data transfer between Magelis and Premium	TSXPCX1031	
7.5	1	Programming software for Magelis XBTG - Vijeo Designer	VJDSSDTGSV42M	**V4.2**
7.6	1	Programming software for Magelis XBTN –XBTL1000	XBTL1003	**V4.3**
7.7	1	Magelis programming cable	XBTZG915	
7.8	1	PowerSuite parameterization software	VW3A8104	**V2.00**
7.9	1	PowerSuite ATV71 Launch parameterization software	VW3A8116	**V2.20**
7.10	1	Altivar set of PC connection accessories	VW3A8106	
7.11	1	ConneXium configurator	Supplied on CD with switch NES27100	**V1.01**
7.12	1	Ethernet switch initialization cord	490NRTJ11	

Component Protection Classes

Mounting Location / Protection Class			
Component	**In the field IP55/IP65**	**In the field IP67**	**Cabinet IP20**
Master switch with or without undervoltage release fuse and built-in release signal			**X**
Emergency-off switch housing XALK	**X**		
Preventa modules XPSxx			**X**
Contactors, LC1			**X**
1-way/2-way switch housing XALD, with components fitted	**X**		
XB5 illuminated pushbuttons and lamps, all colors, flat	**X**		
Auxiliary switch module with LED + 1 auxiliary switch (1x NO), all colors			**X**
Miniature circuit breakers, all types and ratings			**X**
Motor protection switch, all types and ratings			**X**
Phaseo power supplies 24V DC/ 1.2A & 5A			**X**
TSX Premium PLC components			**X**
CANopen taps with CAN cable			**X**
Ethernet switch 499NES27100			**X**
Ethernet hub 499NEH10410			**X**
Advantys STB distributed I/O island			**X**
Advantys FTB distributed I/O island		**X**	
Altivar 31 variable speed drive, 3-phase power supply 380/500 V AC, all rating classes			**X**
Altivar 71 variable speed drive, 3-phase power supply 380/500 V AC, all rating classes			**X**
Magelis XBTG graphic panel, all versions	**X - Front**		
Magelis XBTN text panel, all versions	**X - Front**		

Component Features

Components

Premium PLC: TSX P57 2634M

A Premium TSX PLC power base (2 Series) is used in the example, along with the associated modules for the inputs and outputs. The performance characteristics for the PLC (TSX P57 2634M) are as follows:

- 1024 digital I/O points, 80 analog I/O points
- 24 special modules (counter, axis control, etc.)
- Program memory: 160 kB (with PCMCIA card up to 792 kB)
- 1 fieldbus (Interbus or Profibus), 1 CANopen, 4 AS encoders, 1 Ethernet
- Serial interface and built-in Ethernet link
- 5 programming languages (FBD, LD, SFC, IL, ST)

Alternatively:

Premium PLC: TSX P57 3634M

A Premium TSX PLC power base (3 Series) is used in the example, along with the associated modules for the inputs and outputs. The performance characteristics for the PLC (TSX P57 3634M) are as follows:

- 1024 digital I/O points, 128 analog I/O points
- 32 special modules (counter, axis control, etc.)
- Program memory: 192 kB (with PCMCIA card up to 1792 kB)
- 3 fieldbuses (Interbus, Profibus), 1 CANopen, 8 ASi encoders, 1 Ethernet
- Serial interface and built-in Ethernet link

5 programming languages (FBD, LD, SFC, IL, ST)

CANopen master module: TSX CPP 110

Master interface module for Premium PLCs with the following technical specifications:

- Compliance with standard DS301 V4.01
- Maximum configuration size for Premium PLC:
  - 1 Series: 12 kB (384 flag words in the master task)
  - 2 Series: 16 kB (512 flag words in the master task)
  - 3 Series: 32 kB (1024 flag words in the master task)
  - 4/5 Series: 64 kB (3584 flag words in the master task)
- Baud rates supported 125/250/500/1000 kbps
- Slave monitoring with node guarding or heartbeat
- Configuration via Sycon software
- Bus parameterization via bus backplane module on PLC
- PLC sends configuration every time the power supply is connected

Ethernet switch 499NES27100

- Managed TF switch
- 10/100 MBit/s Ethernet network
- 5 x 10baseT/100baseTX ports
- 2 x 100baseTX ports
- V24 interface
- 24 V DC power supply

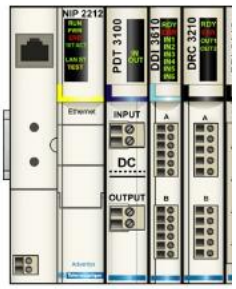
Ethernet switch 499NES18100

- TF switch
- 10/100 MBit/s Ethernet network
- 8x 10baseT/100baseTX ports
- 24 V DC power supply

Ethernet hub 499NEH10410

- TF hub
- 10 MB/s Ethernet network
- 4 x 10baseT ports
- 24 V DC power supply

Components **Advantys STB**
Ctd.



- Modular I/O system with
  - Various fieldbus couplers
  - Analog and digital modules
  - Counter
  - Expert modules
- I/O selectivity 2 to 16 channels
- Open to motor starters, variable speed drives/drives and devices from third-party manufacturers thanks to the bus backplane
- Product dimensions
  - General 120 x 78 mm (HxD)
  - Fieldbus coupler 40.5 mm wide
  - I/Os and power module 13.5 or 18 mm wide
- Advantys STB has 7 different fieldbus interfaces, also called NIM
  - CANopen
  - Ethernet TCP/IP
  - DeviceNet
  - Modbus Plus
  - INTERBUS
  - FIPIO
  - Profibus DP
- Other features
  - Removable memory card
  - I/O modules modified and parameterized via the serial interface
  - Local HMI can be connected via the serial interface
  - Direct, on site open-loop and closed-loop control, even if communication with the PLC fails
  - HotSwap
  - Separate infeed for input and output voltage
  - Detailed diagnostics
  - Reflex functions (intelligent preprocessing)

Components
Ctd.

Advantys

- Block modules for
  - 16 digital inputs
  - 8 digital inputs/8 digital outputs
  - 12 digital inputs/4 digital outputs
  - 16 configurable digital inputs/outputs
- Protection class: IP 65/67
- Plastic or metal housing
- Various fieldbus interfaces
  - Profibus
  - CANopen
  - Interbus
  - DeviceNet
- Diagnostic capability via LED
  - Module diagnostics (bus and voltage monitoring)
  - Channel diagnostics (open circuit, overcurrent, etc.)
- Module and channel diagnostics sent to the PLC via the fieldbus
- Module features
  - Short-circuit-proof and undervoltage monitoring
  - Reverse voltage protection
  - Inputs and outputs electrically isolated from the fieldbus
- Input features
  - Input characteristic according to IEC 1131-2 Type 2
  - Current consumption max. 200 mA per input
  - Reverse voltage protection
- Output features
  - Protection against overvoltage
  - 1.6 A per output

Magelis XBT-G2330 HMI

- Touch panel for message display (5.7", color)
- Backlight status display
- Screw terminal block for connection of 24 VGS power supply
- Interface for expansion unit (for future use)
- 25-pin SUB-D socket connector for serial connection of RS 232 C or RS 485 to the control systems (COM 1)
- Connector for application transfer cable
- Slot with cover for compact flash memory card
- Serial 9-pin SUB-D extension connector (COM 2)
- RJ 45 connector for Ethernet connection (10Base T)

Components
Ctd.

Magelis XBT-N401 HMI

- Display
  - Reduced construction size for installation in compact machines
  - Display front only 132 x 74 mm
  - Depth only 31 mm (terminal)
  - 4 x 20 characters
  - Characters displayed in large format
  - Cyrillic characters
  - 3-color backlight (green, orange, red)
- Ergonomics
  - 8 buttons, 4 of which are labeled
  - Adapt according to requirements using removable labels (cursor control/data modification, function key control and empty keypads)
  - Simple navigation of the application pages
  - 2 command buttons for each page
- Environmental conditions
  - Front face degree of protection: IP 65 in accordance with IEC529, NEMA 4X (outdoor)
  - Rear face degree of protection: IP 20 in accordance with IEC 529
  - Operating temperature range 0°C to 55°C
  - Operating humidity 0 to 85% (no condensation)
  - Vibration rating in accordance with IEC 68-2-6, 10 to 50 Hz 0.075 mm, 57 to 150 Hz 1g
  - Shock resistance in accordance with IEC 68-2-27, 11 ms, 15 g half-sine pulses in 3 axes

Preventa safety relays XPSAF5130

- Category 3 to EN 954 Part 1
- 24 V DC
- 3 safety-oriented switching contacts
- 1 semiconductor output for PLC
- Slimline design

Preventa safety relays XPSAK311144

- Category 3 to EN 954 Part 1
- 24 V DC
- 4 safety-oriented switching contacts
- 2 semiconductor outputs for PLC

Phaseo power supply unit: ABL7RE2403 and ABL7RE2405

- 100 to 240 V AC / 24 V DC
- 3A or 5A secondary
- Slimline design
- Parallel connection possible
- Short-circuit-proof and protected against overload

Altivar variable speed drive: ATV31H037N4 and ATV31H055N4

- 0.37 or 0.55 kW, 380 to 500V AC three-phase
- Integrated class B EMC filter
- Temperature range: -10 to +50°C
- Speed range from 1 to 20 (0 to 200 Hz)
- Velocity control with flow vector check
- Operation via Modbus or CANopen possible
- 2 analog inputs plus 1 analog output
- 6 digital inputs
- 2 or 3 digital status outputs possible
- Protection of drive and motor
- Compact design, side-by-side installation also possible on a top-hat rail using bracket VW3A11852

Altivar variable speed drive: ATV71H037N4

- 0.37 kW, 400 V AC three-phase
- Integrated class B EMC filter
- Temperature range: -10 to +50°C
- Velocity range 0 to 1000 Hz
- Graphic display for control and parameterization
- Operation via Modbus, CANopen or other buses possible
- Option cards: communication, encoder, controller inside
- 2 analog inputs plus 1 analog output
- 6 digital inputs, 2 digital status outputs
- 1 shutdown output (emergency-off function)
- Expansion cards for buses, I/O, control
- Protection of drive and motor
- Compact design, side-by-side installation possible

Components
Ctd.

TeSys model U

- One power base
- Control unit 0.15 to 32 A
  - Only 6 setting ranges up to 32 A
  - Only 4 voltage ranges up to 240 V AC/DC
  - 3 versions: Standard, Extended, Multifunctional
- Overall width 45 mm
- Complete reversing contactor combination 0.15 to 32 A
- Auxiliary switches and function modules
  - Integrated: Motor circuit breaker auxiliary contact 1 NC, with connectors
  - Integrated: Contactor auxiliary contacts 1 NO + 1 NC, freely available
  - Option: Auxiliary switch module with 2 contactor state contacts
  - Option: “Error” and “Selector switch position” signal contact
  - Alarm – thermal overload function module
  - Motor load display function module (0 to 10 V, 4 to 20 mA)
  - Differentiated error display function module (under development)
- Communication modules
  - Parallel wiring; with plug-in connection cables up to eight motor controls can be supplied on one distribution module
  - Modbus RTU protocol
  - AS-Interface
  - CANopen (under development)
  - Gateway: FIPIO/Modbus, DeviceNet/Modbus, Profibus DP/Modbus

Circuit breaker: GV2L10

- 6.3 A
- Short-circuit protection
- Magnetic activation 33.5 A
- Lockable

Unity Pro

Unity Pro is the combined programming, testing and operating software for the Premium, Atrium and Quantum PLCs.

- Unity Pro supports all 5 IEC 61131-3 programming languages as standard with all test functions via PC simulation or online on the PLC directly.
- Thanks to the icon variables that are independent of the memory, the structured data and the user function blocks, the application objects are mapped directly from the special components of the automated process.
- The user configures the Unity Pro operator screens within the application using the graphical libraries. Operator access is simple and direct.
- The test and maintenance functions are simplified thanks to animated graphic objects.
- For diagnosis, all system and application errors are displayed in plain text and in chronological order (date and time is provided at the origin) in a visualization window. You can return to the source of the conditions that have caused the error using the navigation function for troubleshooting.
- XML format, a Web standard for data exchange, has been used as the source format for Unity applications. The simple import/export functions mean that the entire application or parts of it can be exchanged with other software in your project.
- The converters integrated in Unity Pro automatically convert PL7 and Concept programs into Unity Pro programs.

Advantys configuration software

Proceed as follows to configure an Advantys STB system:

- If applicable, parameterize all the I/O modules on the Advantys STB platform (digital, analog and intelligent modules) with standard functions.
- Parameterize the reflex functions executed at island level. These parameters are set using the Advantys configuration software STB SPU 1000.

This software can also be used:

- To optimize island performance by specifying priorities to be applied when processing module data
- To add preferred modules or standard CANopen devices (such as FTB, OTB, ATV31, Lexium05, for example)
- To check that the configuration complies with the design guidelines and to check the current consumption
- To change the module's standard functions.

SyCon

SyCon fieldbus configurator for CANopen, Profibus and INTERBUS

- SyCon is the Schneider Electric fieldbus configurator for the Quantum and Premium PLC range.
- The tool supports CANopen (TSX CPP110) and Profibus DP (TSX PBY100) on the Premium / Micro and Profibus DP (140 CRP 811 00) and INTERBUS (140 NOA 622 00) on the Quantum.
- SyCon also includes the device description files for Schneider Electric I/O modules.

Vijeo Designer

Vijeo Designer configuration software has a number of parameterization windows that enable a project to be developed quickly and simply and are very user-friendly. Vijeo Designer uses Java scripts that allow process data to be further processed on the XBT-G touch panel.

These are some of its functions:

- Navigator,
- Library of animated graphic objects,
- Online help,
- Display of error reports,
- Display of object characteristics,
- Display of the list of variables.

XBT-L1000

The XBT-L1000 configuration software (software reference XBT-L1003) can be used to develop dialog applications for all the HMIs in the Magelis range (XBT-F and XBT-N).
The applications produced using the XBT-L1003 software are independent of the protocol used; an operator dialog application can be used in conjunction with any of the various PLCs that are available from leading market suppliers.

It enables various types of page to be created with ease:

- Application pages (can be linked to one another)
- Alarm pages
- Help pages
- Form pages

The pages can contain variables and graphic objects of any type, which are either predefined using the XBT-L1000 software or created by means of other applications and then imported (bitmaps, etc.). They can have various properties assigned to them: min./max. limits, color, displacement, weighting, etc.
The XBT-L1000 software can be used to configure the function keys, via which commands are to be issued for the machine or application pages are to be called. Moreover, in the case of the graphic HMI, the PLC symbol databases can be imported.

PowerSuite

Dialog tool

- For preparing and saving configuration files
- When connected to the variable speed drive: configuration, setting, controlling and monitoring the drive, downloading files

ConneXium configurator

Online tool:

- Diagnosis and testing of switch Ethernet connections
- Configuration of switch ports

Contact

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